SACRED HEART COLLEGE (AUTONOMOUS), CHALAKUDY

B.Sc. COMPUTER SCIENCE HONOURS

(MINOR AND GENERAL FOUNDATION COURSES)

SYLLABUS & MODEL QUESTION PAPERS *(w.e.f.* 2024 admission onwards)

(FYUGP Regulations 2024)

B.Sc. COMPUTER SCIENCE HONOURS

(MINOR AND GENERAL FOUNDATION COURSES)

SYLLABUS

PROGRAMME OUTCOMES (PO):

At the end of the graduate programme a student would:

Knowledge Acquisition:	
PO1	Demonstrate a profound understanding of knowledge trends and their impact on the chosen discipline of study.
Communication, Collaboration, Inclusiveness, and Leadership:	
PO2	Become a team player who drives positive change through effective communication, collaborative acumen, transformative leadership, and a dedication to inclusivity.
Professional Skills:	
PO3	Demonstrate professional skills to navigate diverse career paths with confidence and adaptability.
Digital Intelligence	
PO4	Demonstrate proficiency in varied digital and technological tools to understand and interact with the digital world, thus effectively processing complex information.
Scientific Awareness and Critical Thinking:	
PO5	Emerge as an innovative problem-solver and impactful mediator, applying scientific understanding and critical thinking to address challenges and advance sustainable solutions.
Human Values, Professional Ethics, and Societal and Environmental Responsibility:	
PO6	Become a responsible leader, characterized by an unwavering commitment to human values, ethical conduct, and a fervent dedication to the well-being of society and the environment.
Research, Innovation, and Entrepreneurship:	
PO7	Emerge as a researcher and entrepreneurial leader, forging collaborative partnerships with industry, academia, and communities to contribute enduring solutions for local, regional, and global development.

PROGRAMME SPECIFIC OUTCOMES (PSO):

At the end of the BSc Computer Science Honours programme a student would:

PSO1	Understand the theoretical and mathematical foundations of Computer Science
PSO2	Understand the concepts of system architecture, hardware, software and network configuration
PSO3	Acquire logical thinking and problem-solving skills to find solutions in the software domain
PSO4	Design, analyse and develop code-based solutions for the algorithms
PSO5	Address the industry demands and assimilate technical, logical and ethical skills needed for the industry
PSO6	Adapt to emerging trends and tackle the challenges in the software field.

GROUPING OF MINOR COURSES IN COMPUTER SCIENCE

The Minor courses given below should not be offered to students who have taken Computer Science as the Major discipline. They should be offered to students from other major discipline

(Title of the Minor: **COMPUTER SCIENCE)**

Group No.	Sl. No.	Course Code	Title	Semester	Total Hrs	Hrs/ Week	Credits	Marks		
								Internal	External	Total
1	**Foundation of Computer Programming** (preferable for Physic and Electronics students)									
	1	CSC1MN 101	Exploring Computer Basics & Computational Thinking	1	75	5	4	30	70	100
	2	CSC2MN 101	Foundations of C Programming	2	75	5	4	30	70	100
	3	CSC3MN 201	Python Programming	3	75	5	4	30	70	100

2	**Data Science and AI** (preferable for Mathematics and Data Science as complementary course)									
	1	CSC1MN 102	Python Programming	1	75	5	4	30	70	100
	2	CSC2MN 102	Introduction to Data Science	2	75	5	4	30	70	100
	3	CSC3MN 202	Introduction to AI and Machine Learning	3	75	5	4	30	70	100
3	**Data Analysis and Visualization** (preferable for Statistics, Econometrics, and Economics students)									
	1	CSC1MN 103	Data analysis using Spreadsheet	1	75	5	4	30	70	100
	2	CSC2MN 103	Fundamentals of SPSS and R programming	2	75	5	4	30	70	100
	3	CSC3MN 203	Data Visualisation using Python	3	75	5	4	30	70	100
4	**Computing Skills and Programming Fundamentals** (preferable for Chemistry, and Industrial Chemistry students)									
	1	CSC1MN 104	Computer Essentials with Word Processing & Presentation	1	75	5	4	30	70	100
	2	CSC2MN 104	Web Design Trends and Techniques	2	75	5	4	30	70	100
	3	CSC3MN 204	Programming fundamentals using C	3	75	5	4	30	70	100

5	**General Computing Principles** (preferable for Humanities, Commerce, Public Administration, and Travel and tourism students)									
	1	CSC1MN 105	Introduction to IT	1	75	5	4	30	70	100
	2	CSC2MN 105	Efficient Office Dynamics	2	75	5	4	30	70	100
	3	CSC3MN 205	Mastering Content Management Systems	3	75	5	4	30	70	100
6	**Fundamentals of Computer Science** (preferable for Microbiology students)									
	1	CSC1MN 106	Computer Fundamentals with MS Excel,_SPSS	1	75	5	4	30	70	100
	2	CSC2MN 106	Fundamentals of the System software, Networks and DBMS	2	75	5	4	30	70	100
	3	CSC3MN 206	Python Programming	3	75	5	4	30	70	100

7	**General awareness in Computer** (for any sream)									
	1	CSC1MN 107	Computer Hardware Assembly	1	75	5	4	30	70	100
	2	CSC2MN 107	Exploring Cyber security in social media	2	75	5	4	30	70	100

	3	CSC3MN 207	Emerging Trends in Computer Science	3	75	5	4	30	70	100

GROUPING OF VOCATIONAL MINOR COURSES IN COMPUTER SCIENCE

(Title of the Vocational Minor: **DATA SCIENCE)**

Group No.	Sl. No.	Course Code	Title	Semester	Total Hrs	Hrs/ Week	Credits	Marks		
								Internal	External	Total
1		DATA SCIENCE								
	1	CSC1VN101	Computational Mathematics in Data Science	1	75	5	4	30	70	100
	2	CSC2VN101	Introduction to Data Science	2	75	5	4	30	70	100
	3	CSC3VN201	Data Analysis and Visualisation Using Spreadsheets	3	75	5	4	30	70	100
	4	CSC8VN401	Predictive Modelling	8	60	4	4	30	70	100

Group No.	Sl. No.	Course Code	Title	Semester	Total Hrs	Hrs/ Week	Credits	Marks		
								Internal	External	Total

2		**Artificial Intelligence**								
	1	CSC1VN102	Statistical Foundations for Artificial Intelligence	1	75	5	4	30	70	100
	2	CSC2VN102	Foundations of	2	75	5	4	30	70	100
			Artificial Intelligence							
	3	CSC3VN202	Automation and Robotics	3	75	5	4	30	70	100
	4	CSC8VN402	Expert Systems and Fuzzy Logic	8	60	4	4	30	70	100

i. Students in Single Major pathway can choose course/courses from any of the Minor/ Vocational Minor groups offered by a discipline other than their Major discipline.

ii. Students in Major with Multiple Disciplines pathway can choose as one of the multiple disciplines, all the three courses from any one of the Minor/ Vocational Minor groups offered by any discipline, other than their Major discipline. If they choose one of the Minor/ Vocational Minor groups offered by their Major discipline as the first one of the multiple disciplines, then their choice as the second one of the multiple disciplines should be any one of the Minor/ Vocational Minor groups offered by a discipline other than the Major discipline. If the students choose any one of the Minor/ Vocational Minor groups in Computer Science as given above, then the title of the group will be the title of that multiple discipline.

(iii). Students in Major with Minor pathway can choose all the courses from any two Minor groups offered by any discipline. If the students choose two Minor groups in Computer Science (three courses from foundations of computing and three courses from foundations of data analytics) as given above, then the title of the Minor will be **Computer science.**

(iv). Students in Major with Vocational Minor pathway can choose all the courses from any two Vocational Minor groups offered by any discipline. If the students choose a Vocational Minor group in Computer Science as given above, then the title of the Vocational Minor will be **Data Science and AI**

DISTRIBUTION OF GENERAL FOUNDATION COURSES IN COMPUTER SCIENCE

Semester	Course Code	Course Title	Total Hours	Hours/ Week	Credits	Marks		
						Internal	External	Total
1	CSC1FM105	Data Analysis and Visualization Through Spread Sheet	45	3	3	25	50	75
2	CSC2FM106	Digital Empowerment Through Ethical Standards	45	3	3	25	50	75

EVALUATION SCHEME

1. The evaluation scheme for each course contains two parts: internal evaluation (about 30%) and external evaluation (about 70%). Each of the Major and Minor courses is of 4-credits. It is evaluated for 100 marks, out of which 30 marks is from internal evaluation and 70 marks, from external evaluation. Each of the General Foundation course is of 3-credits. It is evaluated for 75 marks, out of which 25 marks is from internal evaluation and 50 marks, from external evaluation.
2. The 4-credit courses (Major and Minor courses) are of two types: (i) courses with only theory and (ii) courses with 3-credit theory and 1-credit practical.
    - In 4-credit courses with only theory component, out of the total 5 modules of the syllabus, one open-ended module with 20% content is designed by the faculty member teaching that course, and it is internally evaluated for 10 marks. The internal evaluation of the remaining 4 theory modules is for 20 marks.
    - In 4-credit courses with 3-credit theory and 1-credit practical components, out of the total 5 modules of the syllabus, 4 modules are for theory and the fifth module is for practical. The practical component is internally evaluated for 20 marks. The internal evaluation of the 4 theory modules is for 10 marks.

3. All the 3-credit courses (General Foundational Courses) in Computer Science are with only theory component. Out of the total 5 modules of the syllabus, one open-ended module with 20% content is designed by the faculty member teaching that course, and it is internally evaluated for 5 marks. The internal evaluation of the remaining 4 theory modules is for 20 marks.

Sl. No.	Nature of the Course		Internal Evaluation in Marks (about 30% of the total)		External Exam on 4 modules (Marks)	Total Marks
			Open-ended module / Practical	On the other 4 modules		
1	4-credit course	only theory (5 modules)	10	20	70	100
2	4-credit course	Theory (4 modules) + Practical	20	10	70	100
3	3-credit course	only theory (5 modules)	5	20	50	75

1. MAJOR AND MINOR COURSES

1.1. INTERNAL EVALUATION OF THEORY COMPONENT

Sl. No.	Components of Internal Evaluation of Theory Part of a Major / Minor Course	Internal Marks for the Theory Part of a Major / Minor Course of 4-credits			
		Theory Only		Theory + Practical	
		4 Theory Modules	Open-ended Module	4 Theory Modules	Practical
1	Test paper/ Mid-semester Exam	10	4	5	-
2	Seminar/ Viva/ Quiz	6	4	3	-
3	Assignment	4	2	2	-
		20	10	10	20*
	Total	30		30	

* Refer the table in section 1.2 for the evaluation of practical component

1.2. EVALUATION OF PRACTICAL COMPONENT

The evaluation of practical component in Major and Minor courses is completely by internal evaluation.

- Continuous evaluation of practical by the teacher-in-charge shall carry a weightage of 50%.
- The end-semester practical examination and viva-voce, and the evaluation of practical records shall be conducted by the teacher in-charge and an internal examiner appointed by the Department Council.
- The process of continuous evaluation of practical courses shall be completed before 10 days from the commencement of the end-semester examination.
- Those who passed in continuous evaluation alone will be permitted to appear for the end- semester examination and viva-voce.

The scheme of continuous evaluation and the end-semester examination and viva-voce of practical component shall be as given below:

Sl. No.	Evaluation of Practical Component of Credit-1 in a Major / Minor Course	Marks for Practical	Weightage
1	Continuous evaluation of practical/ exercise performed in practical classes by the students	10	50%
2	End-semester examination and viva-voce to be conducted by teacher-in-charge along with an additional examiner arranged internally by the Department Council	7	35%

3	Evaluation of the Practical records submitted for the end semester viva–voce examination by the teacher-in-charge and additional examiner	3	15%
	Total Marks	20	

1.3. EXTERNAL EVALUATION OF THEORY COMPONENT

External evaluation carries 70% marks. Examinations will be conducted at the end of each semester. Individual questions are evaluated in marks and the total marks are converted into grades by the University based on 10-point grading system (refer section 5).

PATTERN OF QUESTION PAPER FOR MAJOR AND MINOR COURSES

Duration	Type	Total No. of Questions	No. of Questions to be Answered	Marks for Each Question	Ceiling of Marks
2 Hours	Short Answer	10	8 – 10	3	24
	Paragraph/ Problem	8	6 – 8	6	36
	Essay	2	1	10	10
				Total Marks	70

2. GENERAL FOUNDATION COURSES

All the General Foundation Courses (3-credits) in Computer Science are with only theory component.

2.1. INTERNAL EVALUATION

Sl. No.	Components of Internal Evaluation of a General Foundation Course in Computer Science	Internal Marks of a General Foundation Course of 3-credits in Computer Science	
		4 Theory Modules	Open-ended Module
1	Test paper/ Mid-semester Exam	10	2
2	Seminar/ Viva/ Quiz	6	2
3	Assignment	4	1
		20	5
	Total	25	

2.2. EXTERNAL EVALUATION

External evaluation carries about 70% marks. Examinations will be conducted at the end of each semester. Individual questions are evaluated in marks and the total marks are converted into grades by the University based on 10-point grading system (refer section 3).

PATTERN OF QUESTION PAPER FOR GENERAL FOUNDATION COURSES

Duration	Type	Total No. of Questions	No. of Questions to be Answered	Marks for Each Question	Ceiling of Marks

1.5 Hours	Short Answer	10	8 – 10	2	16
	Paragraph/ Problem	5	4 – 5	6	24
	Essay	2	1	10	10
				Total Marks	50

3. LETTER GRADES AND GRADE POINTS

3.1. Mark system is followed for evaluating each question.

3.2. For each course in the semester letter grade and grade point are introduced in 10-point indirect grading system as per guidelines given below.

3.3. The Semester Grade Point Average (SGPA) is computed from the grades as a measure of the student's performance in a given semester.

3.4. The Cumulative GPA (CGPA) is based on the grades in all courses taken after joining the programme of study.

3.5. Only the weighted grade point based on marks obtained shall be displayed on the grade card issued to the students.

LETTER GRADES AND GRADE POINTS

Sl. No.	Percentage of Marks (Internal & External Put Together)	Description	Letter Grade	Grade Point	Range of Grade Points	Class
1	95% and above	Outstanding	O	10	9.50 – 10	First Class with Distinction
2	Above 85% and below 95%	Excellent	A+	9	8.50 – 9. 49	
3	75% to below 85%	Very Good	A	8	7.50 – 8.49	
4	65% to below 75%	Good	B+	7	6.50 – 7.49	First Class
5	55% to below 65%	Above Average	B	6	5.50 – 6.49	
6	45% to below 55%	Average	C	5	4.50 – 5.49	Second Class
7	35% to below 45% aggregate (internal and external put together) with a minimum of 30% in external valuation	Pass	P	4	3.50 – 4.49	Third Class
8	Below an aggregate of 35% or below 30% in external evaluation	Fail	F	0	0 – 3.49	Fail
9	Not attending the examination	Absent	Ab	0	0	Fail

3.6. When students take audit courses, they will be given Pass (P) or Fail (F) grade without any credits.

3.7. The successful completion of all the courses and capstone components prescribed for the three- year or four-year programme with 'P' grade shall be the minimum requirement for the award of UG Degree or UG Degree Honours or UG Degree Honours with Research, as the case may be.

4. COMPUTATION OF SGPA AND CGPA

The following method shall be used to compute the Semester Grade Point Average (SGPA): The SGPA equals the product of the number of credits (Ci) with the grade points (Gi) scored by a student in each course in a semester, summed over all the courses taken by a student in the semester, and then divided by the total number of credits of all the courses taken by the student in the semester,

$$\text{i.e. SGPA (Si)} = \Sigma i\ (Ci \times Gi) \,/\, \Sigma i\ (Ci)$$

where Ci is the number of credits of the i^{th} course and Gi is the grade point scored by the student in the i^{th} course in the given semester. Credit Point of a course is the value obtained by multiplying the credit (Ci) of the course by the grade point (Gi) of the course.

$$\text{SGPA} = \frac{\text{Sum of the credit points of all the courses in a semester}}{\text{Total credits in that semester}}$$

ILLUSTRATION – COMPUTATION OF SGPA

Semester	**Course**	**Credit**	**Letter Grade**	**Grade point**	**Credit Point** (Credit x Grade)
I	Course 1	3	A	8	3 x 8 = 24
I	Course 2	4	B+	7	4 x 7 = 28
I	Course 3	3	B	6	3 x 6 = 18
I	Course 4	3	O	10	3 x 10 = 30
I	Course 5	3	C	5	3 x 5 = 15
I	Course 6	4	B	6	4 x 6 = 24
	Total	20			139
	SGPA				139/20 = 6.950

- The Cumulative Grade Point Average (CGPA) of the student shall be calculated at the end of a programme. The CGPA of a student determines the overall academic level of the student in a programme and is the criterion for ranking the students.

CGPA for the three-year programme in CUFYUGP shall be calculated by the following formula.

$$\text{CGPA} = \frac{\text{Sum of the credit points of all the courses in six semesters}}{\text{Total credits in six semesters (133)}}$$

CGPA for the four-year programme in CUFYUGP shall be calculated by the following formula.

$$\text{CGPA} = \frac{\text{Sum of the credit points of all the courses in eight semesters}}{\text{Total credits in eight semesters (177)}}$$

- The SGPA and CGPA shall be rounded off to three decimal points and reported in the transcripts.
- Based on the above letter grades, grade points, SGPA and CGPA, the University shall issue the transcript for each semester and a consolidated transcript indicating the performance in all semesters.

Detailed Syllabus of Minor Courses

Detailed Syllabus of Minor Courses

Programme	B. Sc. Computer Science
Course Code	CSC1MN101
Course Title	Exploring Computer Basics & Computational Thinking
Type of Course	**Minor**
Semester	I
Academic Level	100-199

Course Details	Credit	Lecture per week	Tutorial per week	Practical per week	Total Hours
	4	3	-	2	75
Pre-requisites	1. Foundation on Mathematics at Plus Two level 2. Foundation on Basic Science at Plus Two Level				
Course Summary					

Course Outcomes (CO):

CO	CO Statement	Cognitive Level*	Knowledge Category#	Evaluation Tools used
CO1	Understanding of computer hardware, software, and basic operation principles	U	C	Exams/ Assignments/ Quizzes/ Seminars/ Practical
CO2	Understand and identify computer hardware components	U, Ap	C	Exam/ Assignments/ Quizzes/ Seminars/ v
CO3	Understand how data is represented and manipulated within a computer system.	U	C	Exam/ Assignments/ Quizzes/ Seminars
CO4	Understand the basics of computer languages, operating systems, and their comparison	U	C	Exam/ Assignments/ Quizzes/ Seminars

CO5	Learn to design and implement algorithms to solve simple computational problems.	U	P	Exam/ Assignments/ Quizzes/ Seminars/ / Practical
CO5	Develop computational thinking skills essential for problem-solving in various domains	Ap	P	Exam/ Assignments/ Quizzes/ Seminars/ / Practical
* - Remember (R), Understand (U), Apply (Ap), Analyse (An), Evaluate (E), Create (C) # - Factual Knowledge(F) Conceptual Knowledge (C) Procedural Knowledge (P) Metacognitive Knowledge (M)				

Detailed Syllabus:

Module	Unit	Content	Hrs	Marks
I	**History, Evolution of Computers, and Number System**		**8**	**15**
	1	Introduction to Computers, Characteristics of Computers	1	
	2	Generations of Computers	1	
	3	Classification of Computers: Super Computers, Main Frame Computers, Mini Computers, Micro Computers	1	
	4	Number Systems (Binary, Decimal, Octal, Hexadecimal) and Conversion	3	
	5	Computer Codes: BCD Code, Excess 3 Code, ASCII Code, Unicode, Gray Code	2	
II	**Basic Computer Organization and Concept of Hardware**		**14**	**20**
	6	● Basic Computer Organization: Input Unit, Storage Unit, Processing Unit, Control Unit, Output Unit	1	
	7	● Concept of hardware	1	
	8	● CPU: Arithmetic and Logic Unit, Control unit	1	
	9	● Memory: Primary Memory, Secondary Memory, Access Time, Storage Capacity-bit, byte, nibble, volatile memory	2	
	10	● Memory hierarchy: Register memory, Cache memory, RAM (Static, Dynamic), ROM(Masked ROM, PROM and EPROM), Secondary storage devices (Magnetic tape, Hard disk, SSD and CD drive)	5	

		● Inside CPU: SMPS, Motherboard, Processor, Storage Devices (HDD, SSD, RAM, ROM).	1	
	11	● Motherboard Components: Processor Slot, Cooling Fan, RAM, Expansion Slots (PCIe), Input/Output Ports, Chipset, BIOS/UEFI Chip, SATA/NVMe Slots, Network Interface, Ports- Ethernet, VGA port, HDMI port, USB port.	3	
III	**Input-Output Devices, Concept of Software**		**12**	**15**
	12	● Input Devices: keyboard, pointing devices (mouse, touchpad), Video digitizer, remote control, joystick, scanner, digital camera, microphone, sensor	2	
	13	● Output Devices: monitor, printer (laser, inkjet, dot-matrix), plotter, speaker, control devices (lights, buzzers, robotic arms, and motors)	2	
	14	● Types of Software: System Software vs. Application Software, Proprietary Vs Open Source	2	
	15	Operating Systems: Functions, types of OS (batch, multiprogramming, time-sharing, real-time, and distributed)	2	
	16	Programming Languages (Machine, assembly & High level),	2	
	17	language Translators (Assembler, Interpreter and Compiler)	2	
1V	**Problem-solving and logical Thinking**		**11**	**20**
	18	Introduction to Problem Solving: Understanding the importance of problem-solving in computer science, Identifying and defining problems in a computational context.	2	
	19	Algorithm and its characteristics	1	
	20	Algorithm Development: Steps involved in designing algorithms, Pseudocode is an intermediate step in algorithm development.	2	
	21	Flowchart Basics: Introduction to flowcharts as a visual representation of algorithms, Understanding flowchart symbols and their meanings	2	
	22	Drawing simple flowcharts	4	
V	**Hands-on Data Structures:** **Practical Applications, Case Study and Course Project**		**30**	

	1	**Hardware:** 1. Identify the given motherboard components. 2. Identify and describe various ports and connectors on the motherboard.	5	
	2	**Software:** 1. Check the hardware compatibility and Install an operating system on a given computer. 2. Install any device driver on a given computer system to communicate with peripheral devices like Printers, Scanner, etc..	5	
	3	**Design Algorithm and visualize it using RAPTOR software** Problem 1: Calculate the Sum of Two Numbers Problem 2: Find the Larger of Two Numbers Problem 3: Check if a Number is Even or Odd Problem 4: Calculate the Factorial of a Number Problem 5: Temperature Conversion Problem 6: Simple Interest Calculation Problem 7: Calculate the Sum of Digits in a Number Problem 8: Check if a Number is Positive, Negative, or Zero Problem 9: Determine if a Triangle is Equilateral, Isosceles, or Scalene Problem 10: Check if a Number is Prime or Composite	20	

Reference Books:

1. Brookshear, J. Glenn. Computer Science: An Overview. 13th ed., Pearson, 2014.
2. Norton, Peter. Introduction to Computers. 7th ed., McGraw-Hill, 2016.
3. Patterson, David A. and John L. Hennessy. Computer Organization and Design: The Hardware/Software Interface. 5th ed., Morgan Kaufmann, 2013.
4. Sedgewick, Robert, and Kevin Wayne. Algorithms. 4th ed., Addison-Wesley Professional, 2011.
5. Knuth, Donald E. The Art of Computer Programming, Volumes 1-4A Boxed Set. Addison- Wesley Professional, 2011.
6. Grover, Aditya Bhargava. Grokking Algorithms: An Illustrated Guide for Programmers and Other Curious People. Manning Publications, 2016.

Mapping of COs with PSOs and POs :

	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PO1	PO2	PO3	PO4	PO5	PO6
CO1	1	2	-	-	-	-	-					

CO 2	1	2	-	-	-	-	-					
CO 3	1	2	-	-	-	-	-					
CO 4	-	2	2	2	-	-	-					
CO 5	-	2	2	2	-	-	-					
CO 6	-	2	2	2	-	1	-					

Correlation Levels:

Level	**Correlation**
-	Nil
1	Slightly / Low
2	Moderate / Medium
3	Substantial / High

Assessment Rubrics:

Quiz / Assignment/ Quiz/ Discussion / Seminar

Midterm Exam

Programming Assignments (20%)

Final Exam (70%)

Mapping of COs to Assessment Rubrics:

	Internal Exam	Assignment	Project Evaluation	End Semester Examinations
CO 1		✓		✓
CO 2	✓	✓		✓
CO 3	✓	✓		✓
CO 4	✓	✓		✓

CO 5	✓	✓		✓
CO 6	✓	✓	✓	✓

Programme	B. Sc. Computer Science				
Course Code	CSC2MN101				
Course Title	Foundations of C Programming				
Type of Course	**Minor**				
Semester	II				
Academic Level	100-199				
Course Details	Credit	Lecture per week	Tutorial per week	Practical per week	Total Hours
	4	3	-	2	75
Pre-requisites	1. Basic Computer Literacy 2. Basic Problem-Solving Skills				
Course Summary	This course teaches the basics of programming using the C language. C is a powerful and widely used programming language known for its efficiency and flexibility. Through this course, students will learn how to write, understand, and debug C code to solve various problems and build simple applications.				

Course Outcomes (CO):

CO	CO Statement	Cognitive Level*	Knowledge Category#	Evaluation Tools used
CO1	Demonstrate a solid understanding of fundamental programming concepts	An	P	Instructor-created lab exams / Quiz
CO2	Develop effective problem-solving skills by applying algorithmic thinking and logical reasoning.	An	P	Problem-solving assessments

CO3	Gain proficiency in writing, compiling, debugging, and executing C programs to implement algorithms, solve	Ap	P	Modeling Assignments
	problems, and create applications.			
CO4	Learn techniques to write efficient and optimized C code, including memory management, algorithm design, and performance tuning, to produce high-quality and scalable software solutions.	Ap	P	Modeling Assignments/ / Case studies
CO5	Understand and apply software development practices such as modular programming, code documentation, and debugging techniques to write maintainable and robust C programs.	Ap	P	Modeling Assignments/ / Case studies
CO6	Develop critical thinking skills by analyzing and evaluating C code, identifying errors and inefficiencies, and proposing solutions to improve code quality and performance.	Ap	P	Hands-on exercises
* - Remember (R), Understand (U), Apply (Ap), Analyse (An), Evaluate (E), Create (C) # - Factual Knowledge(F) Conceptual Knowledge (C) Procedural Knowledge (P) Metacognitive Knowledge (M)				

Detailed Syllabus:

Module	Unit	Content	Hrs	Marks
I	**Problem-solving and logical Thinking**		**10**	**15**

	1	Overview of computational thinking concepts. Definition of algorithm and its characteristics.Understanding the importance of algorithms in problem-solving	2	
	2	Algorithm Development: Steps involved in designing algorithms	2	
	3	Pseudocode as an intermediate step in algorithm development.	1	
	4	Understanding flowchart symbols and their meanings.Learning to represent algorithms using flowcharts.	2	
	5	Raptor as a precursor to text-based programming languages	2	
	6	Drawing simple flowcharts	1	
II	**Introduction to C**		**10**	**20**
	7	Structure of C program	2	
	8	C Character Set, Keywords, Identifiers	1	
	9	Data Types, Variables, Declarations, Symbolic Constants	2	
	10	Operators:Arithmetic, Logical, Relational & Equality, and Unary, Operator Precedence and Associativity	2	
	11	Library Functions, Comments	1	
	12	I/O functions- Formatted scanf() & printf().	2	
III	**Control Statements, Arrays & Strings**		**14**	**20**
	13	Selection Statements:if, if-else, switch	3	
	14	iteration: while, do while, for	4	
	15	Arrays: One dimensional and Two Dimensional(introduction only)	3	
	16	Strings: Basic string handling functions	2	
	17	Structure:Definition, Processing-period Operator, Union(Concepts only)	2	
1V	**User-defined Functions**		**11**	**15**
	18	Definition of function, Advantages, Understanding function prototypes, and declarations	3	
	19	Introduction to function definitions and function calls	3	
	20	Exploring function parameters: actual and formal parameters	2	

	21	Recursion	2	
	22	Pointers-declarations(Basic concept only)	1	
V	**Hands-on C:** **Practical Applications, Case Study and Course Project**		**30**	
	1	Write a C program using Variables and Data Types Write a C program using Arithmetic Operations Write a C program using Loops Write a C program using Arrays Write a C program using Functions Write a C program using Strings	20	
	2	Case study: 1. Library Management System: Develop a program to manage a library's collection of books. Implement functions for adding, removing, and searching for books. 2. Ticket Booking System: Design a program to manage ticket bookings for a cinema or theater.	5	
	3	Capstone/Course Project: Design a real-time project in C	5	

Reference:

1. Balagurusamy, E. Programming in ANSI C. Tata McGraw-Hill Education, 2019.
2. King, K. N. C Programming: A Modern Approach. 2nd ed., W. W. Norton & Company, 2008.
3. Kernighan, Brian W., and Dennis M. Ritchie. The C Programming Language. 2nd ed., Prentice Hall, 1988.
4. Prata, Stephen. C Primer Plus. 6th ed., Addison-Wesley, 2013.
5. Perry, Greg. Absolute Beginner's Guide to C. 3rd ed., Que Publishing, 2014.
6. Oualline, Steve. Practical C Programming. 3rd ed., O'Reilly Media, 1997.
7. Hanly, Jeri R., and Elliot B. Koffman. Problem-Solving and Program Design in C. 8th ed., Pearson, 2016.

8. Gottfried, Byron S. Programming with C. 2nd ed., McGraw-Hill, 1996.

9. Holmes, Dan. C in a Nutshell. 2nd ed., O'Reilly Media, 2015.

Mapping of COs with PSOs and POs :

	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PO1	PO2	PO3	PO4	PO5	PO6
CO1	3	1	-	-	-	1						
CO2	1	-	2	-	-	-						
CO3	-	-	2	-	-	-						
CO4	-	1	3	3	-	3						
CO5	-	2	3	3	-	3						
CO6	-	-	-	-	-	3						

Correlation Levels:

Level	**Correlation**
-	Nil
1	Slightly / Low
2	Moderate / Medium
3	Substantial / High

Assessment Rubrics:

Quiz / Assignment/ Quiz/ Discussion / Seminar

Midterm Exam

Programming Assignments (20%)

Final Exam (70%)

Mapping of COs to Assessment Rubrics :

	Internal Exam	Assignment	Project Evaluation	End Semester Examinations
CO 1		✓		✓
CO 2	✓	✓		✓
CO 3		✓		✓
CO 4	✓			✓
CO 5	✓		✓	✓
CO 6	✓		✓	✓

Programme	B. Sc. Computer Science				
Course Code	CSC3MN201				
Course Title	Python Programming				
Type of Course	**Minor**				
Semester	III				
Academic Level	200-299				
Course Details	Credit	Lecture per week	Tutorial per week	Practical per week	Total Hours
	4	3	-	2	75
Pre-requisites	Have an understanding of algorithms and flowcharts				
Course Summary	This course explores the versatility of Python language in programming and teaches the application of various data structures using Python.				

Course Outcomes (CO):

CO	**CO Statement**	**Cognitive Level***	**Knowledge**	**Evaluation Tools used**
CO1	Understand the basic concepts of Python programming	U	C	Instructor- created exams / Quiz
CO2	Apply problem-solving skills using different control structures and loops	Ap	P	Coding Assignments/ Code reading and review
CO3	Design simple Python programs to solve basic computational problems and acquire knowledge of Python's error-handling mechanisms to effectively debug programs	Ap	P	Coding Assignments/ Exams
CO4	Analyze the various data structures and operations on it using Python	An	P	Instructor-created exams / Case studies
CO5	Apply modular programming using functions	U	C	Instructor- created exams / Quiz

CO6	Identify the necessary Python packages in the domain and create simple programs with it	U, Ap	C, P	Coding
* - Remember (R), Understand (U), Apply (Ap), Analyse (An), Evaluate (E), Create (C) # - Factual Knowledge(F) Conceptual Knowledge (C) Procedural Knowledge (P) Metacognitive Knowledge (M)				

Detailed Syllabus:

Module	Unit	Content	Hrs	Marks
I	**Introduction to Python**		**12**	15
	1	Features of Python, Different methods to run Python,Python IDE	2	
	2	Comments, Indentation, Identifiers, Keywords, Variables	2	
	3	Standard Data Types	2	
	4	Input Output Functions, Import Functions, range function	1	
	5	Operators and Operands, Precedence of Operators, Associativity	2	
	6	Type Conversion, Multiple Assignment	1	
	7	Expressions and Statements, Evaluation of Expressions	1	
	8	Boolean Expressions	1	
II	**Control Structures**		**12**	20
	9	Decision Making- if statement, if…else statement, if…elif…else statement, Nested if statement	5	
	10	Loops - for loop, for loop with else, while loop, while loop with else, Nested Loops	5	
	11	Using indentation in Python to define code blocks	1	
	12	Control Statements- break, continue, pass	1	

III	**Data Structures in Python**		**12**	15
	13	Working with strings and string manipulation	3	
	14	List - creating list, accessing, updating and deleting elements from a list	2	
	15	Basic list operations	1	
	16	Tuple- creating and accessing tuples in python	2	
	17	Basic tuple operations	1	
	18	Dictionary, built in methods to create, access, and modify key-value pairs	2	
	19	Set and basic operations on a set	1	
	Functions		**9**	
IV	20	Built-in functions - mathematical functions, date time functions, random numbers	1	20
	21	Writing user defined functions - function definition, function call, flow of execution, parameters and arguments, return statement	6	
	22	Recursion. Introduction to basic Python libraries (e.g., math, random)	2	
	Hands-on Data Structures: **Practical Applications, Case Study and Course Project**		**30**	
Design programs from the concepts listed below. Select the topics and programs suited for your domain				
V	1	Programs to: • Run instructions in Interactive interpreter and as Python Script • Perform calculations involving integers and floating point numbers using Python arithmetic operators **Data Structures in Python** • String - Create a string , Indexing / Looping / Slicing		

		• Lists - Create a list , Indexing /Looping / Slicing , Adding items / Modifying items / Removing items • Tuples - Create a tuple , Indexing / Looping / Slicing / Adding items to a tuple • Dictionary - Create a dictionary and access values with key / Adding a key- value pair / Adding to an empty dictionary /Modifying values in a dictionary / Removing key-value pair **Function** • Call functions residing in the math module • Define a function for later use • Pass one or more values into a function • Return one or more results from a function		
		Case study: • Create a Todo List Manager where Users should be able to add, remove, and view tasks • Create Student Grade Tracker: Allow users to add students, add grades for subjects, and calculate average grades.		

Reference Books:

1. Jose, Jeeva. Taming Python By Programming. Khanna Book Publishing, 2017. Print.
2. Downey, Allen. Think Python. Green Tea Press, 2nd ed. 2009

Mapping of COs with PSOs and POs :

	PSO1	PSO 2	PSO 3	PSO4	PSO5	PSO6	PO 1	PO2	PO3	PO4	PO5	PO6
CO 1	-	1	2	3	1	1						
CO 2	-	1	2	3	1	1						
CO	-	2	2	3	1	1						
3												

CO 4	1	1	-	-	1	-						
CO 5	1	1	2	2	1	-						
CO 6	-	1	2	2	2	1						

Correlation levels

Level	**Correlation**
-	Nil
1	Slightly / Low
2	Moderate / Medium
3	Substantial / High

Assessment Rubrics:

- Quiz / Assignment/ Quiz/ Discussion / Seminar
- Midterm Exam
- Programming Assignments (20%)
- Final Exam (70%)

Mapping of COs to Assessment Rubrics :

	Internal Exam	Assignment	Project Evaluation	End Semester Examinations
CO 1	✓			✓
CO 2	✓	✓	✓	✓
CO 3	✓		✓	✓
CO 4	✓	✓	✓	✓
CO 5	✓			✓
CO 6	✓			✓

Programme	B. Sc. Computer Science

Course Code	CSC1MN102				
Course Title	Python Programming				
Type of Course	**Minor**				
Semester	I				
Academic Level	100-199				
Course Details	Credit	Lecture per week	Tutorial per week	Practical per week	Total Hours
	4	3	-	2	75
Pre-requisites	Have an understanding about algorithms and flowchart				
Course Summary	This course explores the versatility of Python language in programming and teaches the application of various data structures using Python.				

Course Outcomes (CO):

CO	**CO Statement**	**Cognitiv e Level***	**Knowledg e**	**Evaluation Tools used**
CO1	Understand the basic concepts of Python programming	U	C	Instructor- created exams / Quiz
CO2	Apply problem- solving skills using different control structures and loops	Ap	P	Coding Assignments/ Code reading and review
CO3	Design simple Python programs to solve basic computational problems and acquire knowledge of Python's error handling mechanisms to effectively debug programs	Ap	P	Coding Assignments/ Exams

CO4	Analyse the various data structures and operations on it using Python	An	P	Instructor-created exams / Case studies
CO5	Apply modular programming using functions	U	C	Instructor- created exams / Quiz
CO6	Identify the necessary Python packages in the domain and create simple programs with it	U, Ap	C, P	Coding
* - Remember (R), Understand (U), Apply (Ap), Analyse (An), Evaluate (E), Create (C) # - Factual Knowledge(F) Conceptual Knowledge (C) Procedural Knowledge (P) Metacognitive Knowledge (M)				

Detailed Syllabus:

Module	Unit	Content	Hrs	Marks
	Introduction to Python		**12**	20
	1	Features of Python, Different methods to run Python,Python IDE	2	
	2	Comments, Indentation, Identifiers, Keywords, Variables	2	
	3	Standard Data Types	2	

I	4	Input Output Functions, Import Functions, range function	1	
	5	Operators and Operands, Precedence of Operators, Associativity	2	
	6	Type Conversion, Multiple Assignment	1	

	7	Expressions and Statements, Evaluation of Expressions	1	
	8	Boolean Expressions	1	
II	**Control Structures**		**12**	20
	9	Decision Making- if statement, if…else statement, if…elif…else statement, Nested if statement	5	
	10	Loops - for loop, for loop with else, while loop, while loop with else, Nested Loops	5	
	11	Using indentation in Python to define code blocks	1	
	12	Control Statements- break, continue, pass	1	
III	**Data Structures in Python**		**12**	20
	13	Working with strings and string manipulation	3	
	14	List - creating list, accessing, updating and deleting elements from a list	2	
	15	Basic list operations	1	
	16	Tuple- creating and accessing tuples in python	2	
	17	Basic tuple operations	1	
	18	Dictionary, built in methods to create, access, and modify key-value pairs	2	
	19	Set and basic operations on a set	1	
	Functions		**9**	15
IV	20	Built-in functions - mathematical functions, date time functions, random numbers	1	

	21	Writing user defined functions - function definition, function call, flow of execution, parameters and arguments, return statement	6	
	22	Recursion. Introduction to basic Python libraries (e.g., math, random)	2	

	Hands-on Data Structures: **Practical Applications, Case Study and Course Project**		**30**	
Design programs from the concepts listed below. Select the topics and programs suited for your domain				
V	1	Programs to: • Run instructions in Interactive interpreter and as Python Script • Perform calculations involving integers and floating point numbers using Python arithmetic operators **Data Structures in Python** • String - Create a string , Indexing / Looping / Slicing • Lists - Create a list , Indexing /Looping / Slicing , Adding items / Modifying items / Removing items • Tuples - Create a tuple , Indexing / Looping / Slicing / Adding items to a tuple • Dictionary - Create a dictionary and access values with key / Adding a key- value pair / Adding to an empty dictionary /Modifying values in a dictionary / Removing key-value pair **Function** • Call functions residing in the math module • Define a function for later use • Pass one or more values into a function • Return one or more results from a function		

		Case study: • Create a Todo List Manager where Users should be able to add, remove, and view tasks • Create Student Grade Tracker: Allow users to add students, add grades for subjects, and calculate average grades.		

Mapping of COs with PSOs and POs :

	PSO 1	PSO 2	PSO 3	PSO4	PSO5	PSO6	PO 1	PO2	PO3	PO4	PO5	PO6
CO 1	-	1	2	3	1	1						
CO 2	-	1	2	3	1	1						
CO 3	-	2	2	3	1	1						
CO 4	1	1	-	-	1	-						
CO 5	1	1	2	2	1	-						
CO 6	-	1	2	2	2	1						

Correlation Levels:

Level	Correlation
-	Nil
1	Slightly / Low
2	Moderate / Medium
3	Substantial / High

Assessment Rubrics:

- Quiz / Assignment/ Quiz/ Discussion / Seminar
- Midterm Exam
- Programming Assignments (20%)
- Final Exam (70%)

Mapping of COs to Assessment Rubrics :

	Internal Exam	Assignment	Project Evaluation	End Semester Examinations
CO 1	✓			✓
CO 2	✓	✓	✓	✓
CO 3	✓		✓	✓
CO 4	✓	✓	✓	✓
CO 5	✓			✓
CO 6	✓			✓

Reference Books:

1. Jose, Jeeva. Taming Python By Programming. Khanna Book Publishing, 2017. Print.

2. Downey, Allen. Think Python. Green Tea Press, 2nd ed. 2009

Programme	B. Sc. Computer Science				
Course Code	CSC2MN102				
Course Title	Introduction to Data Science				
Type of Course	**Minor**				
Semester	II				
Academic Level	100-199				
Course Details	Credit	Lecture per week	Tutorial per week	Practical per week	Total Hours

	4	3	-	2	75
Pre-requisites	1. Python Programming 2. Linear Algebra				
Course Summary	This course provides a comprehensive overview of data science, covering the various types of data and their applications. The students will acquire a deep understanding of exploratory data analysis along with hands-on implementation skills. . The curriculum introduces both supervised and unsupervised and techniques of Machine learning. Additionally, the data pre-processing techniques are introduced Overall, the course provides a comprehensive understanding of the fundamental data science principles, guiding students through the data science process and illustrating practical applications.				

Course Outcomes (CO):

CO	CO Statement	Cognitive Level*	Knowledge Category#	Evaluation Tools used
CO1	Understand the types of data and the applications of data science	U	C	Instructor-created exams / Quiz
CO2	Analyse the irregularities present in the data and perform data cleaning	An	C	Problem-solving assessments
CO3	Implement various visualisation techniques on different data types	Ap	P	Modelling Assignments
CO4	Create prediction models using supervised techniques	Ap	P	Modelling Assignments/ / Case studies
CO5	Assess the similarity among the data using unsupervised techniques.	Ap	P	Modelling Assignments/ / Case studies

CO5	Gain insights on advanced data pre-processing techniques	U	C	Instructor-created exams / Quiz

* - Remember (R), Understand (U), Apply (Ap), Analyse (An), Evaluate (E), Create (C)

- Factual Knowledge(F) Conceptual Knowledge (C) Procedural Knowledge (P) Metacognitive Knowledge (M)

Detailed Syllabus:

Module	Unit	Content	Hrs	Marks (70)
I	**Introduction to Data Science**		**10**	**10**
	1	Introduction to Data: Types of Data – Structured Data, Semi-Structured Data, Unstructured Data and Data Streams, Statistical Data Types - Quantitative Data (Ratio and Interval Scale) and Qualitative Data (Nominal and ordinal)	2	
	2	Basic Methods of Data Analysis- Descriptive Data Analysis, Diagnostic Data Analysis or Exploratory Data Analysis, Inferential Data Analysis and Predictive Analysis.	1	
	3	Inferential Statistics: Statistical Inference, Population and Sample, Statistical Modeling, Probability Distributions – Normal, Uniform	3	
	4	Introduction to Data Science: Big Data and Data Science , Data Science Process	2	
	5	Applications of Data Science , Issues and challenges in Data Science	2	

II	**Exploratory Data Analysis**		**14**	**10**
	6	Exploratory Data Analysis (EDA) : Types of EDA - Univariate non-graphical, Multivariate non- graphical, Univariate graphical, and, Multivariate graphical. Methods of EDA – Descriptive Statistics and Data Visualization	5	
	7	Descriptive Statistics - Measures of Central Tendencies, Dispersion, Skewness and Kurtosis.	5	

	8	Data Visualization - Histograms , Box plots , Quantile-Quantile plots Scatter plots , Heat map, Bubble chart , Bar chart, Distribution plot , Pair plot , Line graph , Pie chart, Area chart	4	
III	**Data Preparation for Analysis**		**6**	**15**
	9	Data Cleaning: Handling Missing and Noisy Data, Removing outliers	2	
	10	Data Integration	1	
	11	Data Transformation: Standardization, Normalization	2	
	12	Data Reduction: Dimensionality Reduction - Principal Component Analysis	1	
1V	**Introduction to Machine Learning**		**15**	**15**
	13	Machine Learning Algorithms : Supervised Learning– Classification, Regression, Unsupervised Learning – Clustering, Dimensionality Reduction , Reinforcement Learning	3	
	14	Test /Train Split, Model Training, Bias and Variance, Overfitting and Underfitting	3	
	15	Evaluation	2	
	16	Linear Regression	1	
	17	k-Nearest Neighbors (k-NN)	1	
	18	k-means Clustering	1	
	19	Naive Bayes	1	
	20	Application of Naive Bayes - Spam Filtering	1	
	21	Singular Value Decomposition	1	
	22	Applications of Supervised, Unsupervised and Reinforcement	1	
		Learning		
V	**Hands-on Data Structures:** **Practical Applications, Case Study and Course Project**		**30**	**20**

	1	Implementation of the concepts or the algorithms learned [Binary Classification, Linear Regression, k-NN, k-means clustering, Spam Filtering]	15	
	2	Case study: Perform exploratory data analysis on a real world dataset using Python. Using appropriate Python packages parse, clean and visualize the data .	5	
	3	Capstone/Course Project: Perform an end-to-end project of the data science process.		

Mapping of COs with PSOs and POs :

	PSO1	PSO2	PSO3	PSO4	PSO 5	PSO 6	PO1	PO2	PO3	PO4	PO5	PO6
CO 1	3	-	-	-	-	1						
CO 2	1	-	2	-	-	-						
CO 3	-	-	2	-	-	-						
CO 4	-	2	3	3	-	1						
CO 5	-	2	3	3	-	1						
CO 6	-	-	-	-	-	2						

Correlation Levels:

Level	Correlation
-	Nil
1	Slightly / Low
2	Moderate / Medium

3	Substantial / High

Assessment Rubrics:

Quiz / Assignment/ Quiz/ Discussion / Seminar

Midterm Exam

Programming Assignments (20%)

Final Exam (70%)

Mapping of COs to Assessment Rubrics :

	Internal Exam	Assignment	Project Evaluation	End Semester Examinations
CO 1		✓		✓
CO 2	✓	✓		✓
CO 3		✓		✓
CO 4	✓			✓
CO 5	✓		✓	✓
CO 6	✓		✓	✓

References

1. O'Neil, Cathy, and Rachel Schutt. *Doing data science: Straight talk from the frontline*. " O'Reilly Media, Inc.", 2013.

2. Han, Jiawei, et al. Data Mining: Concepts and Techniques. Netherlands, Elsevier Science, 2011.

3. Shah, Chirag. A Hands-On Introduction to Data Science. United Kingdom, Cambridge University Press, 2020.

4. Chopra, Rohan, et al. Data Science with Python: Combine Python with Machine Learning Principles to Discover Hidden Patterns in Raw Data. United Kingdom, Packt Publishing, 2019.

Programme	B. Sc. Computer Science
Course Code	CSC3MN202

Course Title	Introduction to AI and Machine Learning				
Type of Course	**Minor**				
Semester	III				
Academic Level	200 - 299				
Course Details	Credit	Lecture per week	Tutorial per week	Practical per week	Total Hours
	4	3	-	2	75
Pre-requisites	1. Fundamental Mathematics Concepts: Sets 2. Fundamentals of Python Programming				
Course Summary	This course provides an introduction to the ideas, techniques, and applications of artificial intelligence (AI) is given in this course. The fundamentals of knowledge representation, machine learning, and problem solving will be taught to the students.				

Course Outcomes (CO):

CO	**CO Statement**	**Cognitive Level***	**Knowledge Category#**	**Evaluation Tools used**
CO1	Explain the basic concepts of Artificial Intelligence	U	C	Instructor-created exams / Quiz
CO2	Master Problem-Solving Techniques. Apply a problem solving technique to solve standard AI problems	Ap	P	Practical Assignment / Observation of Practical Skills
CO3	Master various packages required to develop AI and machine learning applications	Ap	C	Seminar Presentation / Group Tutorial Work/ Viva Voce
CO4	Understand few AI tools and an insight to	U	C	Instructor-

	Machine learning, Deep learning concepts			created exams / Home Assignments
CO5	Implement and analyse Machine learning algorithms to solve practical problems.	Ap	P	Writing assignments/ Exams/ Practical
CO6	Apply Concepts in Real-World Projects	Ap	P	Case Study/ mini Project

* - Remember (R), Understand (U), Apply (Ap), Analyse (An), Evaluate (E), Create (C)

- Factual Knowledge(F) Conceptual Knowledge (C) Procedural Knowledge (P) Metacognitive Knowledge (M)

Detailed Syllabus:

Module	Unit	Content	Hrs	Marks(70)
I	**Introduction to Artificial Intelligence & Problem Solving**		**15**	**12**
	1	Introduction to AI – Evolution of AI, AI problems, AI Techniques, AI Applications	4	
	2	Various AI Domains (Introduction only)	2	
	3	Problem Solving Techniques - Search Algorithms, Knowledge representation and reasoning (Concepts only)	3	
	4	Problem Solving Techniques - constraint satisfaction problems, Game playing (Concepts only)	3	
	5	Problem Solving Techniques - Machine learning, Simulated Annealing (Concepts only)	3	
II	**Introduction to Neural Networks**		**8**	**12**
	6	Introduction to Artificial Neural Network	2	
	7	Understanding Brain & Perceptron Model	2	
	8	Single Layer Perceptron Model & Learning in Single layer Perceptron Model	2	
	9	Multi-Layer Perceptron Model & Learning in Multi-layer Perceptron Model	2	

III	**Python Packages for AI**		**15**	**10**
	10	Pandas	3	
	11	MatplotLib	3	
	12	Keras	3	
	13	Scikit-learn:	3	
IV		**Machine Learning Fundamentals**	**7**	**16**
	15	Introduction to Machine learning-	1	
	16	Applications of Machine Learning	1	
	17	Supervised machine learning- Classification, regression (concepts only)	2	
	18	Unsupervised machine learning	1	
	19	clustering, Dimensionality Reduction (concepts only)	1	
	20	Basics of reinforcement learning	1	
	21	Definition and history of deep learning	1	
	22	Key differences between traditional machine learning and deep learning	1	
V	**Hands-on Artificial Intelligence & Machine Learning using Python:** **Practical Applications, Case Study and Course Project**		**30**	**20**
	1	**1. Neural Network** Building a single layer perceptron using Keras **2. Multi-layer Neural Network** Setting up a multi-layer perceptron model **4. Supervised machine learning** Linear regression Decision tree **5. Unsupervised machine learning** K means clustering	20	

		PCA **6. Feature Engineering** Feature selection from a dataset		
	2	Case study – AI tools / Use of AI in any movie	3	
	3	**Implementation of Comparison of any two machine learning algorithms on a dataset**	7	

References

- Elaine Rich, Kevin Knight, Shivsankar B Nair, "Artificial Intelligence", Third Edition, Tata McGraw Hill Publisher
- Tom M. Mitchell, Machine Learning, McGraw-Hill, 1st Ed.
- Ethem Alpaydin, Introduction to Machine Learning- 3rd Edition, PHI.

Mapping of COs with PSOs and POs :

	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PO1	PO2	PO3	PO4	PO5	PO6
CO 1	2	1	1	1	2	1						
CO 2	2	1	2	3	2	2						
CO 3	2	1	2	3	2	3						
CO 4	3	-	1	2	-	-						
CO 5	1	-	2	3	3	3						
CO 6	2	-	3	3	3	3						

Correlation Levels:

Level	**Correlation**
-	Nil
1	Slightly / Low
2	Moderate / Medium

3	Substantial / High

Assessment Rubrics:

Quiz / Assignment/ Quiz/ Discussion / Seminar

Midterm Exam

Programming Assignments (20%)

Final Exam (70%)

Mapping of COs to Assessment Rubrics :

	Internal Exam	Assignment	Practical Evaluation	End Semester Examinations
CO 1	✓	✓		✓
CO 2	✓	✓		✓
CO 3	✓	✓		✓
CO 4	✓	✓		✓
CO 5	✓	✓	✓	✓
CO 6	✓	✓	✓	

Programme	B. Sc. Computer Science				
Course Code	CSC1MN103				
Course Title	Data analysis using Spreadsheet				
Type of Course	**Minor**				
Semester	I				
Academic Level	100-199				
Course Details	Credit	Lecture per week	Tutorial per week	Practical per week	Total Hours
	4	3	-	2	75
Pre-requisites	1. Basic mathematics knowledge 2. Basic computer knowledge				
Course Summary	This syllabus aims to cover a broad spectrum of Excel skills, catering to participants with varying levels of expertise.				

Course Outcomes (CO):

CO	**CO Statement**	**Cognitive Level***	**Knowledge Category#**	**Evaluation Tools used**
CO1	Demonstrate the ability to enter data accurately and efficiently into Excel worksheets	Ap	P	Instructor-created exams / Quiz
CO2	Use of Excel formulas, including basic arithmetic operations, application of common functions calculations in spreadsheets.	Ap	C	Problem-solving assessments
CO3	Use Excel for data analysis, including sorting, filtering, and the creation of Tables.	Ap	P	Instructor-created exams / Quiz

CO4	Demonstrate proficiency	Ap	P	Instructor-created
	in utilizing advanced Excel functions			exams / Quiz
CO5	Demonstrate collaboration skills and the ability represent real world data and create reports	Ap	P	Modelling Assignments/ / Case studies
* - Remember (R), Understand (U), Apply (Ap), Analyse (An), Evaluate (E), Create (C) # - Factual Knowledge(F) Conceptual Knowledge (C) Procedural Knowledge (P) Metacognitive Knowledge (M)				

Detailed Syllabus:

Module	Unit	Content	Hrs	Marks
I	**Introduction to Spreadsheets**		**12**	**18**
	1	Overview - Overview of spreadsheet software (Microsoft Excel, Google Sheets) and their application	2	
	2	Excel Interface and Navigation-Ribbon,Row ,Column, Cell Worksheet,Workbook,Cell Address,Data range,Formula, Chart)	2	
	3	Basic navigation techniques within the workbook	2	
	4	Creating and Saving Workbooks - Creating a new workbook and saving it , Different file formats and when to use them	2	
	5	Inserting or deleting rows or columns	2	
	6	Basic Cell Formatting - Formatting text, numbers, and dates,	2	
II	Data Management		**11**	**18**
	7	Find and select -Find,Replace,Go To,Go To Special	2	

	8	Cell Referencing-Relative, Absolute and Mixed	1	
	9	Sorting data-Quick Sorting,Sorting by Multiple Criteria	2	
	10	Filtering data-Quick Filtering, Filtering by Multiple Criteria , Performing Calculations on Filtered Data	2	
	11	AutoFill and Flash Fill	1	
	12	Remove Duplicates	1	
	13	Get External Data - From web,from text and from other sources	2	
III	Excel Functions and formulas		**10**	**18**
	14	Mathematical and Statistical functions(-SUM, AVERAGE, MAX, MIN, ROUND, ABS, SQRT, MOD.,COUNT, COUNTIF, SUMIF, AVERAGEIF, MEDIAN, STDEV, VAR)	2	
	15	Logical Functions(IF, AND, OR, NOT, XOR, IFERROR, IFNA, SWITCH.)	2	
	16	Text Functions (CONCATENATE, LEFT, RIGHT, MID, LEN, SUBSTITUTE, FIND, SEARCH.)	2	
	17	Date & Time Functions-(TODAY, DATE, DAY, MONTH, YEAR, HOUR, MINUTE, SECOND.)	2	
	18	Using formula :Witing a formula ,Cell reference	2	
1V	Data Analysis and Manipulation		**12**	**16**
	19	Introduction to Tables and Data Organization - Creating and formatting tables for effective data management, Sorting and filtering data within tables	3	
	20	Data Analysis Techniques - Advanced functions (VLOOKUP, HLOOKUP, INDEX, MATCH)	3	
	21	PivotTables and PivotCharts - Understanding PivotTables for data analysis, Creating PivotCharts for visual representation	3	
	22	Data Visualization: Creating and customizing various chart types, Effective use of charts for data presentations	3	
V	**Project and Practical Applications**		**30**	

	1	Practical session on real-world applications (Eg: Use advanced functions relevant to field of study, Tabulation of Lab experiments data for better analysis and visualisation)	15	
	2	Course Project: Creating a comprehensive project using Excel features.	15	

References

1. "Microsoft Excel 2019 Step by Step" by Curtis Frye
2. "Excel 2019 Bible" by Michael Alexander and Richard Kusleika
3. "Microsoft Excel 2019 Data Analysis and Business Modeling" by Wayne Winston

Mapping of COs with PSOs and POs :

	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PO1	PO2	PO3	PO4	PO5	PO6
CO 1	-	-	-	-	2	1						
CO 2	-	-	2	-	2	1						
CO 3	-	-	2	-	2	1						
CO 4	-	-	2	-	2	1						
CO 5	-	-	3	-	2	1						

Correlation Levels:

Level	Correlation
-	Nil

1	Slightly / Low
2	Moderate / Medium
3	Substantial / High

Assessment Rubrics:

Quiz / Assignment/ Quiz/ Discussion / Seminar

Midterm Exam

Programming Assignments (20%)

Final Exam (70%)

Mapping of COs to Assessment Rubrics :

	Internal Exam	Assignment	Project Evaluation	End Semester Examinations
CO 1		✓		✓
CO 2	✓	✓		✓
CO 3		✓		✓
CO 4	✓			✓
CO 5	✓		✓	✓
CO 6	✓		✓	✓

Programme	B. Sc. Computer Science
Course Code	CSC2MN103
Course Title	**Fundamentals of SPSS and R programming**
Type of Course	**Minor**
Semester	II
Academic Level	100-199

Course Details	Credit	Lecture per week	Tutorial per week	Practical per week	Total Hours
	4	3	-	2	75
Pre-requisites	1. Basic computer knowledge 2. Spreadsheet essentials				
Course Summary	This course offers SPSS basics including data management, transformation, visualization and statistical analysis techniques. Also introduces fundamentals of R environment, focusing on data manipulation and visualization.				

Course Outcomes (CO):

CO	CO Statement	Cognitive Level*	Knowledge Category#	Evaluation Tools used
CO1	Perform essential data input and manipulation activities within SPSS.	U	C	Instructor-created exams / Seminar Presentation/ Instructor-created exams/ Quiz
CO2	Implement Data analysis using SPSS	C	C	Assignment / Instructor-created exams
CO3	Compute descriptive statistics and conduct parametric and nonparametric tests in SPSS	C	P	Assignment / Instructor-created exams
CO4	Conduct hypothesis testing and regression analysis in R	Ap	P	Hands-on practical sessions
CO5	Create effective visualizations using SPSS and R.	C	P	
* - Remember (R), Understand (U), Apply (Ap), Analyse (An), Evaluate (E), Create (C) # - Factual Knowledge(F) Conceptual Knowledge (C) Procedural Knowledge (P) Metacognitive Knowledge (M)				

Detailed Syllabus:

Module	Unit	Content	Hrs	Marks
I	**Introduction to SPSS**		**12**	**19**
	1	Features – Data View – Variable View – Output Viewer Window – Syntax Editor Window -	1	
	2	Open data file , Save , import from other data source ,data entry , labelling for dummy numbers	2	
	3	Recode in to same variable, Recode in to different variable, Transpose of data, Insert variables and cases	2	
	4	Merge variables and cases, Split, Select cases, Compute total scores	2	
	5	Table looks – Changing column - font style and sizes	2	
	6	Diagrammatic representation	2	
II	**Data Analysis Using SPSS**		**10**	**18**
	7	Estimation of mean, median and mode- Standard deviation and coefficient of variation.	2	
	8	Descriptive statistics, Parametric tests t-test (paired or unpaired), ANOVA (one-way- two way)	2	
	9	Pearson rank correlation, Linear regression	3	
	10	Non parametric tests: Mann Whitney U test, Wilcoxon signed rank test .	2	
	11	Kruskall Wallis test ,Chi- Square test	1	
III	**Overview of R Environment**		**11**	**18**

	12	R editor, Workspace	2	
	13	Data type – Importing and Exporting Data	2	
	14	Basic Computational Ideas – Merges in R. Matrix Determinant – Inverse – Transpose,Trace)	3	
	15	Eigen Values and Eigen Vectors	2	
	16	Construction of Bar, Pie, Histogram, Line Chart, Box Plot, Scatter Plot	2	
IV	**Parametric and Non Parametric testing of Statistical Hypothesis**		**12**	**15**
	17	One Sample t test, Two group t tests, Paired t test, one way ANOVA, two way ANOVA	3	
	18	Wilcoxon, Mann Witney, Kruskal Wallis Simple Correlation	3	
	19	Linear Regression, Multiple Linear Regression, Testing for overall significance of Model Coefficients – Testing for Individual Regression Coefficients.	2	
	20	Outliers Detection Control Charts, Variable Control Chart, x, R, S.	2	
	21	Attribute Control Chart - p, np, c, u. CUSUM Control Chart, EWMA Control Chart.	2	
	22	Process Capability Analysis, Process Capability Analysis		
V	**Hands-on Word Processor and Presentation Tool:** **Practical Applications, Case Study and Course Project**		**30**	

		SPSS 1. Descriptive Statistics 2. Paired –Samples T Test 3. One-Way ANOVA 4. Correlation & Linear Regression 5. Chi- Square Test **R PROGRAMMING** 6. Simple Correlation 7. Linear Regression 8. One- Way ANOVA 9. Paired T test 10. Plotting Bar Chart	20	
		Case study(Example): **SPSS and R** 1. **Case Study: Customer Satisfaction Analysis** Analyze factors influencing customer satisfaction using survey data. Employ SPSS for regression analysis to identify significant predictors such as product quality, pricing, and customer service. Use R programming to analyse data and make predictions.	10	

Reference Books:

1. Michael S. Louis – Beck (1995). Data analysis an introduction, Series: quantitative applications in the social sciences. Sage, Publications. London

2. Jeremy J. Foster (2001). Data analysis using SPSS for windows. New edition. Versions 8-10. Sage publications. London.
3. Sprankle , M., Problem Solving & Programming Concepts, Pearson India

4. Learning Statistics using R By Rndall E.Schumacker, Sage Publication

5. R for Everyone By Jared P.Lander, Pearson Education

Mapping of COs with PSOs and POs :

	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PO1	PO2	PO3	PO4	PO5	PO6
CO 1	-	-	2	-	2	3						
CO 2	-	-	2	-	2	3						
CO 3	-	-	3	2	3	3						
CO 4	-	-	3	-	3	3						
CO 5	-	-	3	-	3	3						

Correlation Levels:

Level	**Correlation**
-	Nil
1	Slightly / Low
2	Moderate / Medium
3	Substantial / High

Assessment Rubrics:

Quiz / Assignment/ Quiz/ Discussion / Seminar

Midterm Exam

Programming Assignments (20%)

Final Exam (70%)

Mapping of COs to Assessment Rubrics :

	Internal Exam	Assignment	Project Evaluation	End Semester Examinations
CO 1	✓	✓		✓

CO 2	✓	✓		✓
CO 3	✓	✓		✓
CO 4	✓	✓	✓	✓
CO 5	✓	✓	✓	✓

Programme	B. Sc. Computer Science				
Course Code	CSC3MN203				
Course Title	Data Visualisation using Python				
Type of Course	**Minor**				
Semester	III				
Academic Level	200-299				
Course Details	Credit	Lecture per week	Tutorial per week	Practical per week	Total Hours
	4	3	-	2	75
Pre-requisites	Have an understanding about algorithms and flowchart				
Course Summary	This course explores the versatility of Python language in programming and teaches the application of various data structures using Python.				

Course Outcomes (CO):

CO	CO Statement	Cognitie Level*	Knowledge	Evaluation Tools used
CO1	Understand the basic concepts of Python programming	U	C	Instructor- created exams / Quiz
CO2	Apply problem-solving skills using different control structures and loops	Ap	P	Coding Assignments/ Code reading and review
CO3	Design simple Python programs to solve basic computational problems and acquire knowledge of Python's error handling mechanisms to effectively debug programs	Ap	P	Coding Assignments/ exams

CO4	Analyze the various data structures and operations on it using Python	An	P	Instructor-created exams / Case studies
CO5	Apply modular programming using functions	U	C	Instructor- created exams / Quiz
CO6	Identify the necessary Python packages in the domain and create simple programs with it	U, Ap	C, P	Coding
* - Remember (R), Understand (U), Apply (Ap), Analyse (An), Evaluate (E), Create (C) # - Factual Knowledge(F) Conceptual Knowledge (C) Procedural Knowledge (P) Metacognitive Knowledge (M)				

Detailed Syllabus:

Module	Unit	Content	Hrs	Marks
I	**Introduction to Python**		**12**	18
	1	Features of Python, Different methods to run Python,Python IDE	2	
	2	Comments, Indentation, Identifiers, Keywords, Variables	2	
	3	Standard Data Types	2	
	4	Input Output Functions, Import Functions, range function	1	
	5	Operators and Operands, Precedence of Operators, Associativity	2	
	6	Type Conversion, Multiple Assignment	1	
	7	Expressions and Statements, Evaluation of Expressions	1	
	8	Boolean Expressions	1	
	Control Structures		**12**	19
	9	Decision Making- if statement, if…else statement, if…elif…else statement, Nested if statement	5	

II	10	Loops - for loop, for loop with else, while loop, while loop with else, Nested Loops	5	
	11	Using indentation in Python to define code blocks	1	
	12	Control Statements- break, continue, pass	1	
III	**Data Structures in Python**		**12**	19
	13	Working with strings and string manipulation	3	
	14	List - creating list, accessing, updating and deleting elements from a list	2	
	15	Basic list operations	1	
	16	Tuple- creating and accessing tuples in python	2	
	17	Basic tuple operations	1	
	18	Dictionary, built in methods to create, access, and modify key-value pairs	2	
	19	Set and basic operations on a set	1	
	Functions		**9**	18
IV	20	Built-in functions - mathematical functions, date time functions, random numbers	1	
	21	Writing user defined functions - function definition, function call, flow of execution, parameters and arguments, return statement	6	
	22	Recursion. Introduction to basic Python libraries (e.g., math, random)	2	
	Hands-on Data Structures: **Practical Applications, Case Study and Course Project**		**30**	
Design programs from the concepts listed below. Select the topics and programs suited for your domain				

V	1	• Read input, include casting that input to the appropriate type • Select from one of several alternatives by using an if-elif or if- elif-else statement • Use the range() function in a form loop • Call and use functions residing in the math module		
		Case study: ● Design a basic calculator application in Python that can perform addition, subtraction, multiplication, and division. ● Create a Python program that retrieves weather data from an API (e.g., OpenWeatherMap) and displays it.		

	4	**Data Structures in Python** • String - Create a string , Indexing / Looping / Slicing • Lists - Create a list , Indexing /Looping / Slicing , Adding items / Modifying items / Removing items • Tuples - Create a tuple , Indexing / Looping / Slicing / Adding items to a tuple • Dictionary - Create a dictionary and access values with key / Adding a key- value pair / Adding to an empty dictionary /Modifying values in a dictionary / Removing key- value pair		

	5	**Function** • Call functions residing in the math module • Define a function for later use • Pass one or more values into a function • Return one or more results from a function • Call a function that you have defined previously		

Mapping of COs with PSOs and POs :

	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6	PO 1	PO2	PO3	PO4	PO5	PO6
CO 1	-	1	2	3	1	1						
CO 2	-	1	2	3	1	1						
CO 3	-	2	2	3	1	1						
CO 4	1	1	-	-	1	-						
CO 5	1	1	2	2	1	-						
CO 6	-	1	2	2	2	1						

Correlation Levels:

Level	Correlation
-	Nil
1	Slightly / Low
2	Moderate / Medium
3	Substantial / High

Assessment Rubrics:

- Quiz / Assignment/ Quiz/ Discussion / Seminar
- Midterm Exam
- Programming Assignments (20%)

- Final Exam (70%)

Mapping of COs to Assessment Rubrics :

	Internal Exam	Assignment	Project Evaluation	End Semester Examinations
CO 1	✓			✓
CO 2	✓	✓	✓	✓
CO 3	✓		✓	✓
CO 4	✓	✓	✓	✓
CO 5	✓			✓
CO 6	✓			✓

Reference Books:

1. Jose, Jeeva. Taming Python By Programming. Khanna Book Publishing, 2017. Print.
2. Downey, Allen. Think Python. Green Tea Press, 2nd ed. 2009

Programme	B. Sc. Computer Science				
Course Code	CSC1MN104				
Course Title	Computer Essentials with Word Processing & Presentation				
Type of Course	**Minor**				
Semester	I				
Academic Level	100-199				
Course Details	Credit	Lecture per week	Tutorial per week	Practical per week	Total Hours
	4	3	-	2	75
Pre-requisites	1. Fundamental Mathematics Concepts: Number System				
Course Summary	This course serves as an introductory exploration into the foundational concepts of computing. Through a combination of lectures, hands-on exercises, and practical assignments, participants develop a holistic understanding of computer fundamentals. Ultimately, this course serves as a cornerstone for further studies in computer science, information technology, and related disciplines, empowering learners to navigate and contribute to the ever-evolving landscape of computing.				

Course Outcomes (CO):

CO	**CO Statement**	**Cognitive Level***	**Knowledge Category#**	**Evaluation Tools used**
CO1	Gain proficiency in understanding and representing data in various forms, including binary, decimal, hexadecimal, and character encodings.	Ap	F	Instructor-created exams / Quiz
CO2	Understand the basic principles of computer architecture and organization	U	C	Assignment / Demonstrations

CO3	Understand the concept of software and its significance in computing and be familiar with various types of software, including system software, application	U	C	Seminar Presentation / Group Tutorial Work
	software, and utility software.			
CO4	Understand the basic principles of document design and layout for enhanced readability and visual appeal	Ap	P	Hands-on practical sessions
CO5	Understand the importance of effective communication and visual aids in presentations.	Ap	P	Hands-on practical sessions
CO6	Acquire practical skills through hands-on exercises and projects, preparing participants to apply their knowledge in academic, professional, and personal contexts.	Ap	P	Hands-on practical sessions
* - Remember (R), Understand (U), Apply (Ap), Analyse (An), Evaluate (E), Create (C) # - Factual Knowledge(F) Conceptual Knowledge (C) Procedural Knowledge (P) Metacognitive Knowledge (M)				

Detailed Syllabus:

Module	Unit	Content	Hrs	Marks
I	**Introduction to Computer Science and data representation**		**10**	**20**
	1	Introduction to Computers: Generation, Classification, Characteristics of Computers, Significance	2	
	2	Number Systems :Binary, Decimal, Octal, Hexadecimal.	2	
	3	Conversion from one base to another	3	
	4	Computer Codes: BCD Code, Excess 3 Code, ASCII Code, Unicode, Gray Code	3	
II	**Basic Computer Organization**		**10**	**20**
	5	CPU organisation :Arithmetic and Logic Unit, Control Unit	1	
	6	Memory hierarchy: Registers, Cache, Primary Memory, Secondary Memory	2	

	7	Primary Storage: RAM(SRAM, DRAM), ROM**(Masked ROM,** PROM,EPROM,EEPROM)	2	
	8	Secondary storage: SSD,HDD, Magnetic tapes, Disk Storage	2	
	9	Input/Output Unit:- Input Device: Keyboard, MouseTouchpad, Trackball, Scanner, Graphics Tablet, Microphone, Webcam, Joystick/Gamepad, Biometric Input Devices Output Devices: Monitor/Display, Printer,Projector, Speakers, Headphones, Plotter	3	
III	**Understanding Softwares**		**10**	**20**
	10	**Introduction to Software** (Definition and Importance of Software, Types of Software-System software, Application Software, Prop oratory vs Open source)	2	
	11	**Operating Systems** (Introduction to Operating Systems , Common Operating Systems,User Interfaces)	2	
	12	**Device Drivers and Utilities (Device Drivers** , **System Utilities** ,**Productivity Software** ,**Multimedia Software)**	2	
	13	Computer languages(Machine, Assembly and HighLevel), Language Translator- Assembler, Compiler, Interpreter	2	
	14	**Security Software and Best Practices(Antivirus Programs** ,**Firewalls and Security Suites**,**Best Practices for Software Security)**	2	
IV	**Introduction to Word Processing & Presentation**		**15**	**10**
	15	**Basics of Word Processing**: Creating, Opening, Saving, and Closing Documents, Text Entry and Formatting (Font, Size, Color),Paragraph Formatting (Alignment, Spacing),Copying, Cutting, and Pasting Text,Spell Check and Grammar Check)	2	
	16	**Advanced Word Processing Techniques**(Styles and Templates,Tables and Graphics (Inserting, Formatting),Headers and Footers,Page Layout (Margins, Orientation),Document Views (Print Layout, Draft, Outline	2	
	17	Advanced Graphics and Multimedia(SmartArt and Shapes , Customizing SmartArt and shapes,Embedding and Linking Media,Advanced techniques for embedding and linking images, audio, and video)	2	
	18	),Document Collaboration (Track Changes, Comments),Mail Merge for Personalized Documents)	1	

	19	**Introduction to Presentation Software(**Creating a New Presentation, Slide Basics (Adding, Deleting, Rearranging), Slide Layouts and Choosing Templates,Text Entry and Formatting Inserting and Formatting Images and Shapes)	2	

	20	**Enhancing Presentations with Multimedia**(Inserting and Formatting Media (Audio, Video),Transitions Between Slides,Master Slides for Consistent Formatting,Design and Themes for Visual Appeal)	3	
	21	**Animations for Text and Objects (**Slide Show Setup (Timings, Rehearsal)	2	
	22	**Effective Presentation Delivery (**Tips for Engaging Presentations, Presenter View and Speaker Notes, Handling Q&A Sessions, Dealing with Technical Issues, Customizing Presentations for Different Audiences, Printing and Exporting Slides	1	
V	**Hands-on Word Processor and Presentation Tool:** **Practical Applications, Case Study and Course Project**		**30**	
		Identification and familiarization of Hardware Components (Processor, RAM,ROM, Peripheral devices, SSD, HDD, SMPS, Motherboard, Ports)	5	

		Microsoft Word: 1. Document Formatting: ● Create a new document, set margins to 1 inch, and change the page orientation to landscape. ● Apply a consistent font style, size, and color to the entire document. 2. Paragraph Formatting: ● Create a bulleted or numbered list with at least three items. ● Adjust the indentation and line spacing for a specific paragraph. 3. Headers and Footers: ● Insert a header with the document title and page number on the right. ● Add a footer with the date aligned to the center. 4. Tables and Graphics: ● Create a table with four columns and three rows. ● Insert an image into the document and adjust its position. 5. Styles and Themes: ● Apply a heading style to a section of text. ● Change the document theme to give it a different look. **Microsoft PowerPoint:**	20	
		6. Slide Creation: ● Create a new PowerPoint presentation and add five slides. ● Apply different slide layouts to each slide. 7. Text and Object Formatting: ● Add a title to the first slide and format it with a unique font and color. ● Insert a shape and customize its fill and outline colors. 8. Transitions and Animations: ● Apply a slide transition between the first and second slides. ● Add an entrance animation to a text box on the third slide. 9. Master Slides: ● Customize the master slide with a background color or image. ● Add a placeholder for slide numbers in the master slide. 10. Delivery and Export: ● Set up presenter view for a slideshow. Export the presentation as a PDF document		
		Case Study: Exploring feature of PowerPoint to enhance presentation skill	5	

Reference Books:

1. Tanenbaum, Andrew S. and Herbert Bos. Modern Operating Systems. 4th ed., Pearson, 2014.

2. Brookshear, J. Glenn. Computer Science: An Overview. 13th ed., Pearson, 2014.

3. Norton, Peter. Introduction to Computers. 7th ed., McGraw-Hill, 2016.

4. Patterson, David A. and John L. Hennessy. Computer Organization and Design: The Hardware/Software Interface. 5th ed., Morgan Kaufmann, 2013.

5. Stallings, William. Computer Organization and Architecture: Designing for Performance. 10th ed., Pearson, 2016.

6. Hennessey, John L. and David A. Patterson. Computer Architecture: A Quantitative Approach. 6th ed., Morgan Kaufmann, 2017.

Mapping of COs with PSOs and POs :

	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PO1	PO2	PO3	PO4	PO5	PO6
CO 1	3	-	-	-	-	-						
CO 2	2	3	-	-	-	-						
CO 3	-	-	1	1	-	-						
CO 4	-	-	2	3	-	-						
CO 5	-		-	3	-	-						
CO 6	-	-	-	3	-	-						

Correlation Levels:

Level	Correlation
-	Nil
1	Slightly / Low
2	Moderate / Medium
3	Substantial / High

Assessment Rubrics:

Quiz / Assignment/ Quiz/ Discussion / Seminar

Midterm Exam

Programming Assignments (20%)

Final Exam (70%)

Mapping of COs to Assessment Rubrics :

	Internal Exam	Assignment	Project Evaluation	End Semester Examinations
CO 1	✓	✓		✓
CO 2	✓	✓		✓
CO 3	✓	✓		✓
CO 4			✓	✓
CO 5			✓	✓
CO 6			✓	

Programme	B. Sc. Computer Science Minor				
Course Code	CSC2MN104				
Course Title	Web Design Trends and Techniques				
Type of Course	**Minor**				
Semester	II				
Academic Level	100-199				
Course Details	Credit	Lecture per week	Tutorial per week	Practical per week	Total Hours
	4	3	-	2	75
Pre-requisites	1. Knowledge in Computers. 2. Basic knowledge in Internet and Basic knowledge Computers and Internet				
Course Summary	The aim of this course is to provide students with an understanding of the basic concepts in web browser and to achieve the basic web designing skills				

Course Outcomes (CO):

CO	CO Statement	Cognitive Level*	Knowledge Category#	Evaluation Tools used
CO1	To get general introduction to internet	U	C	
CO2	To identify and analyse the current trends in web designing	Ap	P	
CO3	To understand basic knowledge in HTML5 and CSS3 for responsive web design	Ap	P	
CO4	To learn how to design a simple web applications	Ap	P	
CO5	To incorporate user experience principle in web design	Ap	P	
CO6	To Enable student to become	Ap	P	
	proficient in web designing through current technologies			

* - Remember (R), Understand (U), Apply (Ap), Analyse (An), Evaluate (E), Create (C)

- Factual Knowledge(F) Conceptual Knowledge (C) Procedural Knowledge (P) Metacognitive Knowledge (M)

Detailed Syllabus:

Module	Unit	Content	Hrs
I	**Introduction to Web Design**		**09**
	1	Overview of Internet	1
	2	Over view of Internet Security	1
	3	Client Server System	1
	5	Websites and Digital Communication Tools	1
	6	Collaboration for Website Development	1
	7	Understanding the evolution of web design	2
	8	Exploring current design trends	1

	9	Overview of innovative websites	1
II	**HTML – Building the Foundation**		**12**
	10	Understanding the basic structure of web pages(Role of HTML, basic concept of webpage, html document structure <!DOCTYPE>,<html>,<head>,<body>).	2
	11	Exploring tags, attributes, and their significance (font type, text formatting tag, otrher text related tag, heading, paragraphs, list, link, image, common attributes like class, id, src, alt, href).	2
	12	Creating interactive forms to collect user data(form element tag like <form>,<input>,<textarea>,<select>,<button>,various form controls like text input, button, drodwonbox).	3
	13	Designing and structuring tabular data.(Basic table structure tag, colspan, rowspan)	2
	14	Enhancing the meaning and structure of your content(understanding semantic elements, benifit of semantic HTML).	3
III	**CSS – Styling Your Web Pages**		**12**
	15	Introduction to CSS(understanding the concept of styling, presentation, basic synatx electors, properties and values, inline, internal and external style, different types of selectors)	3
	16	Introduction to common CSS properties(color,font,text,margin, padding, border, background), CSS box model(margin, border, padding and content), positioning elementss (static, relative, absolute, fixed, z-index)	3
	17	Introduction to layouts in web desigining, The role of responsive layouts, Flexbox layout model, creating Grid, Media queries and breakpoints	3
	18	Transition properties(duration, timing function, property), CSS Animation, Adding interactive hover effect. Overview of CSS frameworks and their benefits. Introduction to Bootstrap and its features.	3
IV	**JavaScript Essentials**		**12**

	19	Overview of Javascript, declaring the variables and understanding data types. Object in Javascript, basic operations and control flow in Javascript	3
	20	Understanding the Document Object Model (DOM).Using selectors to target HTML elements. Modifying content, attributes, and styles dynamically. Using selector, content, attributes and styles dynamically. Creating and Deleting elements. Navigating through the DOM hierarchy.	3
	21	Understanding events triggered, common events, writing event handlers, Bubbling and capturing phases of event propagation, controlling event flow, accessing event object	3
	22	Overview of JavaScript libraries and their benefits.Selecting elements, manipulating the DOM, and handling events with jQuery.Applying visual effects and animations with jQuery. Fade, slide, show/hide, and custom animations.Making asynchronous requests with jQuery.ajax(). Handling JSON data and updating the DOM dynamically.	3
V	**Hands-on Programming in Java(Using VSCode, Atom, Aptana Studio):**		**30**
	Practical Applications, Case Study and Course Project		
	1	Implement the following:	
		1. Program for implementing html tags	20
		2. Write program for implementing Style a paragraph (<p>) to have a red color, a font size of 16px, and a bold font weight	
		3. Write a program to implement CSS Box Model	
		4. Create a simple layout using Flexbox, with three div elements aligned horizontally.	
		5. Implement a media query that changes the background color of a webpage when the screen width is less than 600 pixels.	
		6. Write a JavaScript function that changes the text content of an HTML element with the id "demo" to "Hello, World!" when a button is clicked.	
		7. Declare a variable in JavaScript and assign it a string value. Also, mention the data type of the variable.	

		8. Write a JavaScript program for attaching a click event to a button. 9. Use JavaScript to make an asynchronous request to a JSON file and display the data on the webpage. 10. Use JavaScript to perform AJAX operation	
	2	Case Study	2
	3	**Project:** Build a web application for perform responsive web application.	8

Text Book :

1. HTML5 Black Book, Covers CSS3, JavaScript, XML, XHTML, AJAX, PHP And JQuery (Second Edition), Dreamtech Press,ISBN: 9789351199076

References :

1. Internet and World Wide Web, H.M.Dietel, Pearson.
2. Mastering HTML, CSS & Javascript Web Publishing (English, Paperback, Lemay Laura)
3. Web Designing (English, Paperback, Hirdesh Bhardwaj)

Mapping of COs with PSOs and POs :

	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PO1	PO2	PO3	PO4	PO5	PO6
CO 1	1	-	3	3	-	-						
CO 2	1	-	3	3	-	-						
CO 3	-	-	3	3	2	3						
CO 4	-	-	2	3	-	-						
CO 5	-	-	3	3	2	3						
CO 6			3	3	3							

Correlation Levels:

Level	Correlation
-	Nil
1	Slightly / Low
2	Moderate / Medium
3	Substantial / High

Assessment Rubrics:

Quiz / Assignment/ Quiz/ Discussion / Seminar

Midterm Exam

Programming Assignments (20%)

Final Exam (70%)

Mapping of COs to Assessment Rubrics :

	Internal Exam	Assignment	Project Evaluation	End Semester Examinations
CO 1	✓			✓
CO 2	✓			✓
CO 3	✓	✓		✓
CO 4		✓		✓
CO 5		✓		✓

Programme	B. Sc. Computer Science				
Course Code	CSC3MN204				
Course Title	Programming fundamentals using C				
Type of Course	**Minor**				
Semester	III				
Academic Level	200-299				
Course Details	Credit	Lecture per week	Tutorial per week	Practical per week	Total Hours
	4	3	-	2	75
Pre-requisites	1. Basic Computer Literacy 2. Basic Problem-Solving Skills				
Course Summary	This course teaches the basics of programming using the C language. C is a powerful and widely used programming language known for its efficiency and flexibility. Through this course, students will learn how to write, understand and debug C code to solve various problems and build simple applications.				

Course Outcomes (CO):

CO	**CO Statement**	**Cognitive Level***	**Knowledge Category#**	**Evaluation Tools used**
CO1	Demonstrate a solid understanding of fundamental programming concepts	An	P	Instructor-created lab exams / Quiz
CO2	Develop effective problem-solving skills by applying algorithmic thinking and logical reasoning.	An	P	Problem-solving assessments
CO3	Gain proficiency in writing, compiling, debugging, and executing	Ap	P	Modelling Assignments

	C programs to implement algorithms, solve problems, and create applications.			
CO4	Learn techniques to write efficient and optimized C code, including memory management, algorithm design, and performance tuning, to produce high-quality and scalable software solutions.	Ap	P	Modelling Assignments/ / Case studies
CO5	Understand and apply software development practices such as modular programming, code documentation and debugging techniques to write maintainable and robust C programs.	Ap	P	Modelling Assignments/ / Case studies
CO6	Develop critical thinking skills by analyzing and evaluating C code, identifying errors and inefficiencies, and proposing solutions to improve code quality and performance.	Ap	P	Hands-on exercises
* - Remember (R), Understand (U), Apply (Ap), Analyse (An), Evaluate (E), Create (C) # - Factual Knowledge(F) Conceptual Knowledge (C) Procedural Knowledge (P) Metacognitive Knowledge (M)				

Detailed Syllabus:

Module	Unit	Content	Hrs	Marks
I	**Problem solving and logical Thinking**		**10**	**15**
	1	Overview of computational thinking concepts. Definition of algorithm and its characteristics .Understanding the importance	2	

		of algorithms in problem-solving		
	2	Algorithm Development:Steps involved in designing algorithms	2	
	3	Pseudocode as an intermediate step in algorithm development.	1	
	4	Understanding flowchart symbols and their meanings .Learning to represent algorithms using flowcharts.	2	
	5	Raptor as a precursor to text-based programming languages	2	
	6	Drawing simple flowcharts	1	
II	**Introduction to C**		**10**	**20**
	7	Structure of C program	2	
	8	C Character Set, Keywords, Identifiers	1	
	9	Data Types, Variables, Declarations, Symbolic Constants	2	
	10	Operators :Arithmetic, Logical, Relational & Equality, and Unary, Operator Precedence and Associativity	2	
	11	Library Functions, Comments	1	
	12	I/O functions- Formatted scanf() & printf().	2	
III	**Control Statements,Arrays & Strings**		**14**	**20**
	13	Selection Statements: if, if-else, switch	3	
	14	Iteration: while, do while, for	4	
	15	Arrays: One dimensional and Two Dimensional(introduction only)	3	
	16	Strings:Basic string handling functions	2	
	17	Structure :Definition,Processing-period Operator, Union(Concepts only)	2	
1V	**User defined Functions**		**11**	**15**
	18	Definition of function,Advantages, Understanding function prototypes and declarations	3	
	19	Introduction to function definitions and function calls	3	
	20	Exploring function parameters : Actual and Formal parameters	2	
	21	Recursion	2	

	22	Pointers-declarations(Basic concept only)	1	
V	**Hands-on C:** **Practical Applications, Case Study and Course Project**		**30**	
	1	Write a C program using Variables and Data Types Write a C program using Arithmetic Operations Write a C program using Loops Write a C program using Arrays Write a C program using Functions Write a C program using Strings	20	
	2	Case study: 1. Library Management System: 2. Develop a program to manage a library's collection of books. Implement functions for adding, removing, and searching for books. 3. Ticket Booking System: Design a program to manage ticket bookings for a cinema or theater.	5	
	3	Capstone/Course Project: Design a real-time project in C	5	

Reference:

1. Balagurusamy, E. Programming in ANSI C. Tata McGraw-Hill Education, 2019.
2. King, K. N. C Programming: A Modern Approach. 2nd ed., W. W. Norton & Company, 2008.
3. Kernighan, Brian W., and Dennis M. Ritchie. The C Programming Language. 2nd ed., Prentice Hall, 1988.
4. Prata, Stephen. C Primer Plus. 6th ed., Addison-Wesley, 2013.
5. Perry, Greg. Absolute Beginner's Guide to C. 3rd ed., Que Publishing, 2014.
6. Oualline, Steve. Practical C Programming. 3rd ed., O'Reilly Media, 1997.
7. Hanly, Jeri R., and Elliot B. Koffman. Problem Solving and Program Design in C. 8th ed., Pearson, 2016.
8. Gottfried, Byron S. Programming with C. 2nd ed., McGraw-Hill, 1996.
9. Holmes, Dan. C in a Nutshell. 2nd ed., O'Reilly Media, 2015.

Mapping of COs with PSOs and POs :

	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PO1	PO2	PO3	PO4	PO5	PO6
CO 1	3	1	-	-	-	1						
CO 2	1	-	2	-	-	-						

CO 3	-	-	2	-	-	-						
CO 4	-	1	3	3	-	3						
CO 5	-	2	3	3	-	3						
CO 6	-	-	-	-	-	3						

Correlation Levels:

Level	Correlation
-	Nil
1	Slightly / Low
2	Moderate / Medium
3	Substantial / High

Assessment Rubrics:

Quiz / Assignment/ Quiz/ Discussion / Seminar
Midterm Exam
Programming Assignments (20%)
Final Exam (70%)

Mapping of COs to Assessment Rubrics :

	Internal Exam	Assignment	Project Evaluation	End Semester Examinations
CO 1		✓		✓
CO 2	✓	✓		✓
CO 3		✓		✓
CO 4	✓			✓
CO 5	✓		✓	✓
CO 6	✓		✓	✓

Programme	B. Sc. Computer Science
Course Code	CSC1MN105
Course Title	INTRODUCTION TO IT

Type of Course	**Minor**				
Semester	I				
Academic Level	100-199				
Course Details	Credit	Lecture per week	Tutorial per week	Practical per week	Total Hours
	4	3	-	2	75
Pre-requisites	Basic understanding of computer operation Basic Science fundamentals				
Course Summary					
The course will create an overall generic awareness about scope of the field of IT and to impart basic personal computing skills and will create background knowledge for the various courses in the programme.					

Course Outcomes (CO): .

CO	**CO Statement**	**Cognitive Level***	**Knowledge Category#**	**Evaluation Tools used**
CO1	Understand basic terminology in the field of IT	U	C	Instructor-created exams / Assignment
CO2	Identify and describe essential computer hardware components.	U	C	Viva Voce
CO3	Comprehend the distinction between system software and application software and their respective roles in computer functionality	U	C	Practical / Group Work
CO4	Produce documents with precision and efficiency using LaTeX	Ap	P	Practical / Group Work
CO5	Understand the basics of networking and internet concepts.	U	C	Practical/Exam/ Assignments

* - Remember (R), Understand (U), Apply (Ap), Analyse (An), Evaluate (E), Create (C)

- Factual Knowledge(F) Conceptual Knowledge (C) Procedural Knowledge (P) Metacognitive Knowledge (M)

Detailed Syllabus:

Module	Unit	Content	Hrs	Marks
I	**Characteristics of Computers**		**10**	**15**
	1	Characteristics: Automatic, speed, accuracy, memory, diligence; Digital signals, Instruction set	**2**	
	2	Evolution of computers and generation of computers	**2**	
	3	Classification of computers: Microcomputer, Minicomputer, mainframes, Supercomputers; Personal computers: Desktop,Laptops	**2**	
	4	Binary System and data representation (BCD,ASCII,Unicode)	**3**	
	5	Hardware & Software,Von Neumann model.	**1**	
II	**Hardware**		**13**	**19**
	6	CPU- CU, ALU, Registers	**2**	
	7	Memory units: RAM(SDRAM, DRAM)- feature wise comparison only); ROM-(PROM,EPROM,EEPROM)	**2**	
	8	Auxiliary storage: Flash memory ,Magnetic devices, HDD SSD,	**2**	
	9	Input devices - keyboard, mouse, scanner, speech input devices, digital camera, Touch screen, Joystick, Optical readers, bar code reader	**3**	
	10	Output devices: Display device-Mouse, Joystick, Touchscreens, LCD, Plasma, LED, Printers: Dot-matrix, Inkjet, Laser; Plotters, speaker.	**4**	
III	**Software**		**12**	**20**
	11	System software, Application software ,examples	**1**	
	12	Operating systems: Single user, Multitasking, Time-sharing ,multi-user;	**1**	

	13	Basic features of OS: Process management, Memory management, Device Management,	**2**	
	14	Booting, POST	**1**	
	15	Computer Viruses & Protection	**2**	
	16	Free software, Open source	**1**	
	17	LaTeX : Introduction, installation, and basic document creation,Text styling, sectioning, and lists, Citations and references, Inserting images and creating tables.	**4**	
IV	**Computer Networks**		**10**	**16**
	18	Requirements for a network	**1**	
	19	Server, Workstation, switch, router, network operating systems	**2**	
	20	Internet: brief history, World Wide ,Web, Websites, URL, Browsers, Search engines	**2**	
	21	Internet connections: ISP, Dial-up, cable modem	**2**	
	22	Characteristics of web-based systems, Web pages, introduction to HTML.	**3**	
V	**Practical Applications, Case Study and Course Project**		**30**	
	1	1. Document Basics: Create a document with a title, author, and date. 2. Sections and Headings: Add sections and subsections with headings. 3. Lists: Insert bulleted and numbered lists. 4. Graphics: Insert images and adjust their placement. 5. Tables: Create tables with rows and columns. 6. References: Add citations and create a bibliography. 7. Formatting: Apply styles like bold, italics, and underline.	**20**	

	2	**Case study:** 1. Academic Essay:Write an essay on a chosen topic, formatting headings, paragraphs, and citations using LaTeX commands. 2. Research Paper: Write a structured paper on a chosen topic, incorporating sections, citations, and formatting using LaTeX.	**10**	

References

1. P. K Sinha, Fundamentals of Computers
2. Behrouz A Forouzan, Data Communication & Networking, MC Graw Hill Reference Books:
3. Tanenbaum, Andrew S. and Herbert Bos. Modern Operating Systems. 4th ed., Pearson, 2014.
4. Norton, Peter. Introduction to Computers. 7th ed., McGraw-Hill, 2016.
5. Harel, David. Algorithmics: The Spirit of Computing. 3rd ed., Addison-Wesley, 2004.
6. LaTeX Beginner's Guide - Second Edition. Author(s): Stefan Kottwitz.Publisher(s): Packt Publishing.

Mapping of COs with PSOs and POs:

	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PO1	PO2	PO3	PO4	PO5	PO6
CO 1	1	1	-	-	-	-						
CO 2	2	2	-	-	-	-						
CO 3	2	2	-	-	1	-						

CO 4	-	-	-	-	2	-						
CO 5	-	-	-	-	1	-						

Correlation Levels:

Level	Correlation
-	Nil
1	Slightly / Low
2	Moderate / Medium
3	Substantial / High

Assessment Rubrics:

- Quiz / Assignment/ Quiz/ Discussion / Seminar
- Midterm Exam
- Programming Assignments (20%)
- Final Exam (70%)

Mapping of COs to Assessment Rubrics:

	Internal Exam	Assignment	Project Evaluation	End Semester Examinations
CO 1	✓	✓		✓
CO 2	✓	✓		✓
CO 3	✓	✓		✓
CO 4	✓	✓		✓
CO 5	✓	✓		✓
CO 6	✓	✓		✓

Programme	B. Sc. Computer Science
Course Code	CSC2MN105

Course Title	Efficient Office Dynamics				
Type of Course	Minor				
Semester	II				
Academic Level	100-199				
Course Details	Credit	Lecture per week	Tutorial per week	Practical per week	Total Hours
	4	3	-	2	75
Pre-requisites	Basic understanding of computer operation Basic Science fundamentals				
Course Summary					
This course provides students with ample training in office automation tools, focusing on Microsoft Word, Excel, and Presentation software, along with internet-based applications.					

Course Outcomes (CO): .

CO	CO Statement	Cognitive Level*	Knowledge Category#	Evaluation Tools used
CO1	Understand basic concepts of office automation and the need for technology in the workplace.	U	P	
CO2	Develop proficiency in using a variety of office automation tools, including word processing software, spreadsheet applications, presentation software	C	P	
CO3	Understand the importance of maintaining an organized and accessible document repository.	U	C	
CO4	Develop basics of office automation tools integrated with internet technologies like cloud-based productivity suites, collaboration	U	P	
	platforms, communication tools.			

CO5	develop enhanced through hands-on practice and practical exercises, to increase productivity skills using office automation tools.	Ap,C	P	

* - Remember (R), Understand (U), Apply (Ap), Analyse (An), Evaluate (E), Create (C)

- Factual Knowledge(F) Conceptual Knowledge (C) Procedural Knowledge (P) Metacognitive Knowledge (M)

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Detailed Syllabus:

Module	Unit	Content	Hrs	Marks
I	**Documentation Using a Word Processor (Oppen Office or MS Office)**		**12**	**20**
	1	Introduction to Office Automation: Definition and types	**1**	
	2	Word Processor: Definition, Use, Options, Ribbon Menu	**1**	
	3	Creating and Editing Document: New, Open, Save, Working with Text (Insert, Selecting, Deleting, Copy, Cut, Paste, Drag and Drop)	**2**	
	4	Formatting the Document : Font Size, Font Style, Margin, Header and Footer, Page Number, Numbering, Bullets, Tables, Image, Hyperlink, Autocorrect, Proofing Tools, Dictionary, Book mark, Find and Replace	**3**	
	5	Advanced Features: Inserting Pictures, Shapes, Smart Art, Charts, Orientation, Page Size, Symbols and Special Characters, Equations,	**2**	
	6	Intending Tabs, Line and Paragraph Spacing, Textbox, Word Arts, Auto Recover, Print Options	**1**	
	7	Mail Merge and Macros	**2**	
II	**Electronic Spread Sheet(OpenOffice Calc/MS-Excel)**		**15**	**20**
	8	Spreadsheet: Definition, Advantage, Use, Workbook, Worksheet	**1**	

	9	Creating and Editing Spreadsheet: File Tab, Cell, Tabs, Groups, Commands, Help	**1**	
	10	Spreadsheet Essential: View Button, Sheet Area, Row Bar, Column Bar, Status Bar, Autofill, Range, Saving Worksheet and Workbook, Hiding and Unhiding	**3**	
	11	Formatting the Spreadsheet: Spell Check, Find and Replace, Insert, Cell Formatting, Font, Rotating Cell, Alignment, Merge Cell, Boarder, Freezing and Unfreezing, Margin,	**3**	
	12	Formulas and Functions: Basic Maths Functions, AutoSum, Roman, Round, Basic Statistical Functions, Basic Financial Functions	**4**	
	13	Advanced Features: Macro, Pivot Table, Preparing Graphs and Charts	**3**	
III	**Working with Presentation (OpenOffice Impress/MS-Power Point)**		**10**	**15**
	14	Presentation: Definition, Use, Advantage,	**1**	
	15	Creating Presentation: Create, Open, Save, Add Slide, Insert Picture, Insert Clip Arts	**2**	
	16	Manipulating Presentation: Style, Theme, Font, Header and Footer, Hyperlink, Inserting Tables and Charts, Slide Transition	**3**	
	17	Organisational Chart and Layered Objects,	**2**	
	18	Manage Animation and Effects	**2**	
IV	**Internet and World Wide Web**		**8**	**15**
	19	Internet: Definition, What is Network (LAN, WAN, MAN), Internet Service Provider HTTP, FTP, Email, World Wide Web and its evolution, URL.	**2**	
	20	Internet Protocols (Concept Only), Domain Name Server, Internet Address, Wi-Fi	**2**	
	21	Search Engine(Google, Bing, Yahoo, DuckDuckgo, Ask.com) and Browsers (Internet Explorer, Firefox,	**2**	

		Chrome, Opera, Safari, Netscape)		
	22	Cloud-based platforms and applications. SaaS ,Cloud storage and file sharing services	**2**	
V	**Hands-on Training:** **Practical Applications, Case Study and Course Project (Use any Office Software)**		**30**	**30**
	1	**Word Processing** 1. Perform Paragraph formatting. 2. Perform Newspaper style Document. 3. Perform Table creation. 4. Perform Mail merge. 5. Perform Page formatting & printing.	**30**	
	2	**Spreadsheet** 6. Perform Worksheet entries. 7. Perform Cell Forming. 8. Chart creation. 9. Perform Basic Mathematical Functions. 10. Performa Basic Statistical Functions. 11. Perform any 3 Financial Functions.		
	3	**Presentation Software** 12. Creating presentations and performing basic formatting. 13. Perform Animations like adding pictures, slide orientation, and slide theme. 14. Add Sound to Slideshow. 15. Create Organizational Charts and Layered Objects.		
	4	**Internet**		

		16. Crimping and Connecting LAN CableIP address configuring. 17. Assign Static I/P Address. 18. Setup a Wired LAN with more than two systems and share the documents. 19. Setup a Wireless LAN with more than two systems and share the documents 20. Installing any Brower and assign default serach engine as Google		

References

1. Russell A. Stultz, *Learn Microsoft Office*, BPB Publication.
2. Winston, Microsoft Excel 2013: Data Analysis and Business Modeling, Prentice Hall India Learning Private Limited (2013), ISBN: 9788120349605
3. H. M.Deitel, P. J. Deitel, et al., *Internet & World Wide Web - How to program*, Prentice

Mapping of COs with PSOs and POs:

	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PO1	PO2	PO3	PO4	PO5	PO6
CO 1	1	2	-	-	-	-						
CO 2	-	2	-	-	-	-						
CO 3	-	2	-	-	1	-						
CO 4	-	2	-	-	-	-						
CO 5	-	2	-	-	1	-						
CO 6	-	2	-	-	1	-						

Correlation Levels:

Level	Correlation
-	Nil
1	Slightly / Low

2	Moderate / Medium
3	Substantial / High

Assessment Rubrics:

- Quiz / Assignment/ Quiz/ Discussion / Seminar
- Midterm Exam
- Programming Assignments (20%)
- Final Exam (70%)

Mapping of COs to Assessment Rubrics:

	Internal Exam	Assignment	Project Evaluation	End Semester Examinations
CO 1	✓	✓		✓
CO 2	✓	✓		✓
CO 3	✓	✓		✓
CO 4	✓	✓		✓
CO 5	✓	✓		✓
CO 6	✓	✓		✓

Programme	B.Sc Computer Science				
Course Code	CSC3MN205				
Course Title	Mastering Content Management Systems				
Type of Course	**Minor**				
Semester	III				
Academic Level	200-299				
Course Details	Credit	Lecture per week	Tutorial per week	Practical per week	Total Hours
	4	3	-	2	45

Pre-requisites	1. Familiarity with web content management systems (CMS). 2. Basic knowledge of internet technologies provides a foundation for learning web design.
Course Summary	The course covers fundamental web design concepts, including HTML and CMS principles, and focuses on Drupal as a robust content management system. Students will learn to create and customise websites using Drupal, exploring its features, such as content types, themes, and modules to build dynamic and interactive web pages.

Course Outcomes (CO):

CO	CO Statement	Cognitive Level*	Knowledge Category#	Evaluation Tools used
CO1	Cultivate a robust understanding of web design fundamentals, laying a strong foundation for their journey into the dynamic world of digital design and development.	U	C	Assignment / Instructor-created exams / Quiz
CO2	Attain comprehensive knowledge and practical proficiency in Content Management Systems (CMS), empowering to navigate and excel in the ever-evolving landscape of digital content creation and management.	U	C	Assignment / Instructor-created exams / Quiz
CO3	Develop expertise in Drupal, a widely used CMS platform, gaining comprehensive understanding of its features, configuration, and installation processes, thus preparing them for proficient and innovative web development endeavors.	Ap	P	Practical Assignment / Instructor-created exams / Quiz
CO4	Impart a comprehensive understanding of website development using Drupal and facilitate the acquisition of expertise across various options within the Drupal ecosystem.	Ap	P	Practical Assignment / Instructor-created exams / Quiz

CO5	Gain an understanding of how to apply web design concepts to real-world scenarios, effectively designing and developing functional and aesthetically pleasing websites utilizing the Drupal CMS.	C	P	Practical Assignment / Instructor-created exams / Quiz
CO6	Develop proficiency in advanced website management skills, including installing and configuring modules, managing menus, and more, to effectively navigate and optimize the functionality of websites built on the Drupal platform.	C	P	Practical Assignment / Instructor-created exams / Quiz
* - Remember (R), Understand (U), Apply (Ap), Analyse (An), Evaluate (E), Create (C) # - Factual Knowledge(F) Conceptual Knowledge (C) Procedural Knowledge (P) Metacognitive Knowledge (M)				

Detailed Syllabus:

Module	Unit	Content	Hrs	Marks
I	**Introduction to Web Designing**		**08**	**15**
	1	Basics of Web Designing -World Wide Web (WWW), W3C, Web Browser	2	
	2	Web Server, Web Hosting, Web Pages	2	
	3	Domain Name System, Uniform Resource Locator	1	
	4	Overview of HTML: Definition and Basic structure	3	
II	**Introduction to CMS**		**09**	**15**
	5	Introduction to Content Management Systems (CMS) - Features of CMS	2	
	6	Web Content Management System	2	
	7	Components of Content Management System	2	
	8	Enterprise Content Management System	3	
III	**Introduction to Drupal**		**13**	**20**
	9	Drupal - Features, Advantages and Disadvantages,	2	

	10	Comparison of Wordpress and Drupal	1	
	11	Installation and Configuration	2	
	12	Content types and Field	2	
	13	Drupal Architecture	2	
	14	User Management, Managing Comments	2	
	15	Creating and Customizing Themes	2	
IV	**Building Website**		**15**	**20**
	16	Website Development - Working with Templates and Template files	2	
	17	Articles, Creating Web Forms	2	
	18	Managing blocks, Add Links to Blocks, Moving Elements within Block	3	
	19	Blocks and Regions	2	
	20	Creating and Customizing Views	2	
	21	Installing and Configuring Modules	2	
	22	Static Pages, Creating Pages, Menu Management.	2	
V	**Hands-on Programming**		**30**	**30**
		1. Install Drupal on your local server and configure it to run. 2. Create a new content type called "Blog Post" with fields for title, body, and image. 3. Add a new field to the user profile for "Job Title" using Drupal's field management system. 4. Customise the default theme by changing the colours and		

		fonts. 5. Create a new custom theme from scratch and apply it to your Drupal site. 6. Add a new block to the sidebar displaying recent blog posts. 7. Create a custom view that displays a list of all users with their job titles. 8. Configure Drupal's built-in caching system to improve performance. 9. Install and configure a contributed module from Drupal.org to extend the functionality of your site. 10. Implement a custom module that adds a new feature to your Drupal site, such as a contact form or slideshow. 11. Set up user permissions to restrict access to certain parts of the site based on user roles. 12. Use the Drupal Views module to create a dynamic page that displays a grid of images from a specific content type. 13. Implement a responsive design for your Drupal site using CSS media queries. 14. Use Drupal's taxonomy system to categorise content and create a navigation menu based on taxonomy terms. 15. Test your site's accessibility using automated tools and make any necessary adjustments to improve accessibility for users with disabilities.		

Mapping of COs with PSOs and POs:

	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PO1	PO2	PO3	PO4	PO5	PO6
CO 1	1	3	1	1	3	1						
CO 2	1	3	2	1	3	1						
CO 3	1	3	1	1	3	2						

CO 4	1	3	3	1	3	2						
CO 5	3	3	3	1	3	2						
CO 6	1	3	3	1	3	2						

Correlation Levels:

Level	Correlation
-	Nil
1	Slightly / Low
2	Moderate / Medium
3	Substantial / High

Assessment Rubrics:

Quiz / Assignment/ Quiz/ Discussion / Seminar

Midterm Exam

Programming Assignments (20%)

Final Exam (70%) **Mapping of**

COs to Assessment Rubrics:

	Internal Exam	Assignment	Practical Evaluation	End Semester Examinations
CO 1	✓	✓		✓
CO 2	✓	✓		✓
CO 3	✓	✓		✓
CO 4	✓	✓		✓
CO 5	✓	✓		✓
CO 6	✓	✓		✓

References:

1. Jennifer Campbell, Jennifer T Campbell, Web Design: Introductory, Course Technology.

2. Jason Beaird and Alex Walker, The Principles of Beautiful Web Design, SitePoint.

3. Bob Boiko, Content Management Bible, Wiley.

4. Daniel Sipos, Drupal 9 Module Development, Packt Publishing Limited

Programme	B. Sc. Computer Science				
Course Code	CSC1MN106				
Course Title	Computer Fundamentals with MS Excel,SPSS				
Type of Course	**Minor**				
Semester	I				
Academic Level	100-199				
Course Details	Credit	Lecture per week	Tutorial per week	Practical per week	Total Hours
	4	3	-	2	75
Pre-requisites	1. Fundamental Mathematics Concepts 2. Basic computer knowledge				
Course Summary	The course provides enough understanding of computer fundamentals, MS Excel, and SPSS. Students learn basic computing concepts, data entry, manipulation, and analysis in Excel and statistical analysis techniques using SPSS.				

Course Outcomes (CO):

CO	CO Statement	Cognitive Level*	Knowledge Category#	Evaluation Tools used
CO1	Understand fundamental concepts and skills essential for understanding and operating a computer system	U	C	Instructor-created exams / Seminar Presentation/ Instructor-created exams/ Quiz

CO2	Execute fundamental data input and manipulation tasks in MS Excel	C	P	Assignment / Instructor-created exams
CO3	Perform essential data input and manipulation activities within SPSS.	C	P	Assignment / Instructor-created exams
CO4	Implement Data analysis using SPSS	Ap	P	Hands-on practical sessions
CO5	Implement Data analysis using MS EXCEL	Ap	P	Hands-on practical sessions
* - Remember (R), Understand (U), Apply (Ap), Analyse (An), Evaluate (E), Create (C) # - Factual Knowledge(F) Conceptual Knowledge (C) Procedural Knowledge (P) Metacognitive Knowledge (M)				

Detailed Syllabus:

Module	Unit	Content	Hrs	Marks
I	**Introduction to computer system**		**12**	**19**
	1	Features, Limitations, Types	1	
	2	Number systems and character representation, Binary arithmetic	2	
	3	Basic components of computer -	2	
	4	Computer software types,Utility Program, Operating systems functions and types	2	
	5	Input and output devices ,Primary memory and secondary storage	2	
	6	Overview of Emerging Technologies: cloud computing, big data, data mining, mobile computing and embedded systems	2	
	7	Use of Computers in Education and Research: Data analysis, Heterogeneous storage, e-Library, Google Scholar, Domain specific packages such as SPSS, MATLAB, Mathematica etc	1	
II	**Introduction to Spread Sheet**		**10**	**18**

	7	MS Excel - Creating & Editing Worksheet, Formatting and Essential Operations	2	
	8	Formulas and Functions, Charts	2	
	9	Advanced features: Vlookup,Hlookup, Index, Address, Match, Offset, Transpose, Conditional Formatting, Data Sorting and Filtering	3	
	10	Pivot table & Pivot Chart	2	
	11	Linking and Consolidation	1	
III	**Introduction to SPSS**		**12**	**18**
	12	Features – Data View – Variable View – Output Viewer Window – Syntax Editor Window -	2	
	13	Open data file , Save , import from other data source ,data entry , labelling for dummy numbers	2	
	14	Recode in to same variable, Recode in to different variable, Transpose of data, Insert variables and cases	2	
	15	Merge variables and cases, Split, Select cases, Compute total scores	2	
	16	Table looks – Changing column - font style and sizes	2	
	17	Diagrammatic representation	2	
IV	**Data Analysis Using Ms Excel & SPSS**		**12**	**15**
	18	Estimation of mean, median and mode- Standard deviation and coefficient of variation.	3	
	19	Descriptive statistics, Parametric tests t-test (paired or unpaired), ANOVA (one-way- two way)	3	

	20	Pearson rank correlation, Linear regression	2	
	21	Non parametric tests: Mann Whitney U test, Wilcoxon signed rank test .	2	
	22	Kruskall Wallis test ,Chi- Square test5x	2	
V	**Hands-on Word Processor and Presentation Tool:** **Practical Applications, Case Study and Course Project**		**30**	
		EXCEL 1. Create a chart 2. Measures of Central Tendency & Descriptive Statistics 3. Parametric Tests T-Test 4. Correlation & Linear Regression 5. Chi- Square Test SPSS 6. Descriptive Statistics 7. Paired –Samples T Test 8. One-Way ANOVA 9. Correlation & Linear Regression 10. Chi- Square Test	20	
		Case study: Data analysis study on publically available biological data like bacterial growth analysis.		

Reference Books:

1. A. Goel, Computer Fundamentals, Pearson Education, 2010.

2. P. Aksoy, L. DeNardis, Introduction to Information Technology, Cengage Learning, 2006

3. P. K.Sinha, P. Sinha, Fundamentals of Computers, BPB Publishers, 2007

4. Excel Functions and Formulas Paperback by Bernd Held

5. Microsoft Excel 2010 Data Analysis and Business Modeling Paperback by Winsto

6. Jeremy J. Foster (2001). Data analysis using SPSS for windows. New edition. Versions 8-10. Sage publications. London.

7. Michael S. Louis – Beck (1995). Data analysis an introduction, Series: quantitative applications in 1
8. the social sciences. Sage, Publications. London.

Mapping of COs with PSOs and POs :

	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PO1	PO2	PO3	PO4	PO5	PO6
CO 1	2	2	1	-	2	3						
CO 2	-	-	2	-	2	3						
CO 3	-	-	2	-	2	3						
CO 4	-	-	2	-	2	3						
CO 5	-	-	2	-	2	3						

Correlation Levels:

Level	**Correlation**
-	Nil
1	Slightly / Low
2	Moderate / Medium
3	Substantial / High

Assessment Rubrics:

Quiz / Assignment/ Quiz/ Discussion / Seminar

Midterm Exam

Programming Assignments (20%)

Final Exam (70%) **Mapping of**

COs to Assessment Rubrics :

	Internal Exam	Assignment	Project Evaluation	End Semester Examinations
CO 1	✓	✓		✓
CO 2	✓	✓		✓
CO 3	✓	✓		✓
CO 4	✓	✓	✓	✓
CO 5	✓	✓	✓	✓

Programme	B. Sc. Computer Science				
Course Code	CSC2MN106				
Course Title	Fundamentals of System Software, Networks and DBMS				
Type of Course	**Minor**				
Semester	II				
Academic Level	100-199				
Course Details	Credit	Lecture per week	Tutorial per week	Practical per week	Total Hours
	4	3	-	2	75
Pre-requisites	Basic understanding of computer operation Basic Science fundamentals				
Course Summary					
The course covers essential concepts in operating systems, network protocols, and database management systems, providing foundational knowledge for computer science and IT careers.					

Course Outcomes (CO):

CO	CO Statement	Cognitive Level*	Knowledge Category#	Evaluation Tools used

CO1	Understand System Software principles	U	C	Instructor-created Exams / Assignment/ Viva Voce
CO2	Understand basic concepts of operating systems functions	U	C	Instructor-created Exams / Assignment/ Viva Voce
CO3	Interpret the concepts of data communications system and its components	An	C	Instructor-created Exams / Assignment/ Viva Voce
CO4	Acquire a good understanding of the architecture and functioning of Database Management Systems.	U	C	Instructor-created Exams / Assignment/ Viva Voce
CO5	Construct basic SQL queries to retrieve and manipulate data as required.	C	P	Practical/Exam/ Assignments
* - Remember (R), Understand (U), Apply (Ap), Analyse (An), Evaluate (E), Create (C) # - Factual Knowledge(F) Conceptual Knowledge (C) Procedural Knowledge (P) Metacognitive Knowledge (M)				

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Detailed Syllabus:

Module	Unit	Content	Hrs	Marks
I			**11**	18
	1	Overview of System software and Application Software	1	
	2	System Software Components: operating systems, compilers, and device drivers.	1	
	3	Compilers: Classification of programming languages and language processors	2	
	4	Types of Operating System	3	
	5	Functions of Operating System	**3**	
II	**Computer networks**		**12**	18

	6	Goals of networking	1	
	7	network topologies	1	
	8	types of networks (LAN, MAN and WAN)	1	
	9	Communication Media-Guided (Twisted Pair, Coaxial Cable and Fiber Optic) and	2	
	10	Communication Media -Unguided (microwave, satellite)	2	
	11	Network OSI model- 7 layers	3	
	12	Internet Layer- 5 layers	2	
III	Database Management Systems		**12**	18
	13	Introduction to DB and DBMS:Definition	1	
	14	Advantages of DBMS	1	
	15	Three schema architecture of DBMS(External,Conceptual and internal)	1	
	16	Data Independence: Logical data independence and Physical data independence	2	
	17	Structure of Database Management System	2	
	18	Data models (Relational Model,Network Model. c. The Hierarchical Model. Object-Oriented Model)	5	
IV	**Structured query language - Create, insert, select, update, delete, alter, drop commands**		**10**	16
	19	DML	2	
	20	DDL	3	
	21	Constraints	2	
	22	Operators and functions	3	
V	**Practical Applications, Case Study and Course Project**		**30**	

	1	1. **Create Database**: ● Write a SQL query to create a new database in MySQL. 2. **Create Table**: ● Create tables with various data types for columns such as INT, VARCHAR, DATE, etc. ● Include constraints such as PRIMARY KEY, FOREIGN KEY, UNIQUE, NOT NULL, etc. 3. **Insert Data**: ● Insert records into tables using the INSERT INTO statement. ● Practice inserting data into tables with	20	

		different data types. 4. **Retrieve Data**: ● Write SELECT queries to retrieve data from tables. ● Retrieve specific columns using SELECT. ● Filter rows using the WHERE clause. 5. **Update Data**: ● Update existing records in a table using the UPDATE statement. ● Modify records based on specific conditions using the WHERE clause. 6. **Delete Data**: ● Delete records from a table using the DELETE statement. ● Remove records based on specific conditions using the WHERE clause. 7. **Sorting and Filtering**: ● Sort the result set using ORDER BY clause. ● Filter records using various conditions such as equality, comparison operators, and logical operators. 8. **Grouping and Aggregation**: ● Group rows using GROUP BY clause. ● Use aggregate functions like COUNT(), SUM(), AVG(), MIN(), and MAX(). 9. **String Functions**: ● Use string functions like CONCAT(), SUBSTRING(), UPPER(), LOWER(), etc.		

		● Manipulate string data in SELECT queries. 10. **Date and Time Functions**: ● Use date and time functions like DATE(),		

		NOW(), YEAR(), MONTH(), DAY(), etc. ● Work with date and time data in SELECT queries. 11. **Mathematical Functions**: ● Use mathematical functions like ROUND(), CEIL(), FLOOR(), ABS(), etc. ● Perform mathematical operations on numeric data in SELECT queries. 12. **Conditional Functions**: ● Use conditional functions like IF(), CASE statement, etc. ● Implement conditional logic in SELECT queries.		
		Case study: 1. **Library Management System**: Track books, borrowers, and transactions, facilitating library operations efficiently. 2. **Student Information System**: Manage student records, courses, grades, and attendance for academic institutions. 3. **Employee Database System**: Store employee details, salaries, and performance evaluations, streamlining HR processes for companies.	10	

References

1 P. K Sinha, Fundamentals of Computers

2. D. M Dhamdhere,Operating System: A concept based Approach

3. Behrouz A Forouzan, Data Communication & Networking, MC Graw Hill

4. "Learning MySQL: Get a Handle on Your Data" by Seyed M.M. (Saied) Tahaghoghi and Hugh E. Williams.

Mapping of COs with PSOs and POs:

	PSO 1	PSO 2	PSO 3	PSO 4	PSO5	PSO6	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6
CO 1	-	2	1	-	1	3						
CO 2	-	2	1	-	1	3						
CO 3	-	2	1	-	1	3						
CO 4	-	2	1	-	1	3						
CO 5	-	2	1	-	1	3						
CO 6	-	-	2	-	1	3						

Correlation Levels:

Level	Correlation
-	Nil
1	Slightly / Low
2	Moderate / Medium
3	Substantial / High

Assessment Rubrics:

- Quiz / Assignment/ Quiz/ Discussion / Seminar
- Midterm Exam
- Programming Assignments (20%)
- Final Exam (70%)

Mapping of COs to Assessment Rubrics:

	Internal Exam	Assignment	Project Evaluation	End Semester Examinations
CO 1	✓	✓		✓
CO 2	✓	✓		✓
CO 3	✓	✓		✓
CO 4	✓	✓		✓
CO 5	✓	✓		✓

CO 6	✓	✓		✓

Programme	B. Sc. Computer Science				
Course Code	CSC3MN206				
Course Title	Python Programming				
Type of Course	**Minor**				
Semester	III				
Academic Level	200-299				
Course Details	Credit	Lecture per week	Tutorial per week	Practical per week	Total Hours
	4	3	-	2	75
Pre-requisites	Have an understanding about algorithms and flowchart				
Course Summary	This course covers fundamentals of Python programming and teaches essential tools for data manipulation and analysis				

Course Outcomes (CO):

CO	**CO Statement**	**Cognitiv e Level***	**Knowledg e**	**Evaluation Tools used**
CO1	Understand the basic concepts of Python programming	U	C	Instructor- created exams / Quiz
CO2	Apply problem- solving skills using different control structures and loops	Ap	P	Coding Assignments/ Code reading and review

CO3	Implement simple Python programs to solve basic computational problems and GUI	Ap	P	Coding Assignments/ exams
	applications			
CO4	Analyze the various data structures and operations on it using Python	An	P	Instructor-created exams / Case studies
CO5	Apply modular programming using functions	Ap	C	Instructor- created exams / Quiz
CO6	Identify the necessary Python packages in the domain and create simple programs with it	U, Ap	C, P	Coding
* - Remember (R), Understand (U), Apply (Ap), Analyse (An), Evaluate (E), Create (C) # - Factual Knowledge(F) Conceptual Knowledge (C) Procedural Knowledge (P) Metacognitive Knowledge (M)				

Detailed Syllabus:

Module	Unit	Content	Hrs	Marks
	Problem solving strategies		**12**	15
	1	Problem analysis – formal definition of problem	1	
	2	Top- down design – breaking a problem into sub problems	2	
	3	Overview of the solution to the sub problems by writing step by step procedure (algorithm)	2	

I	4	Repesentation of procedure by flowchart	1	
	5	Implementation of algorithms – use of procedures to achieve modularity.	2	

	6	Examples for algorithms and flow charts - At least ten problems Starting with non-numerical examples, and numeric problems like factorial, largest	4	
II	**Introduction to Python**		**13**	19
	7	Variables, Data types	2	
	8	Expressions and Statements, Evaluation of Expressions	2	
	9	Operators and Operands, Order of precedence, Boolean Expressions and logical operators, String Operations	2	
	10	Control statements,Conditional and alternative executions, Nested Conditionals, Recursion	2	
	11	Iteration - Multiple Assignment, While Statement	2	
	12	Tables, Two Dimensional Tables	2	
	13	Encapsulation and generalization, Local Variables	1	
	Introduction to NumPy		**12**	18
	14	The Basics of NumPy Arrays, Computation on NumPy Arrays: Universal Functions	3	
	15	Aggregations: Min, Max, and Everything in Between	2	
	16	Computation on Arrays:Broadcasting, Comparisons, Masks, and Boolean Logic.	2	
	17	Fancy Indexing, Sorting Arrays	2	

III	18	Structured Data: NumPy's Structured Arrays.	2	
	Functions		**8**	18
		Functions, Calling functions, Type conversion and coercion, composition of functions	2	

IV	19			
	20	Mathematical functions, User-defined Functions, Parameters and Arguments.	2	
	21	Strings and Lists – string traversal and comparison with List operations with Examples,	2	
	22	Tuples and dictionaries – Operations and Examples.	2	
	Hands-on Data Structures: **Practical Applications, Case Study and Course Project**		**30**	
Design programs from the concepts listed below. Select the topics and programs suited for your domain				

V	1	• Program to demonstrate basic data types in python • Program to demonstrate operators in python. • A cashier has currency notes of denominations 10, 50, and 100. If the amount to be withdrawn is input through the keyboard using input () function in hundreds, find the total number of currency notes of each denomination the cashier will have to give to the withdrawer. • Program to demonstrate list and tuple in python. • A library charges a fine for every book returned late. For first 5 days the fine is 50 paisa, for 6-10 days fine is one rupee and above 10 days fine is 5 rupees. If you return the book after 30 days your membership will be cancelled. • Write a program to accept the number of days the member is late to return the		

		book and display the fine or the appropriate message • Write a Program for checking whether the given number is an even number or not. • Write a Python program to print Fibonacci series. • Write function to compute gcd and lcm of two numbers. • Using a for loop, write a program that prints out the decimal equivalents of 1/2, 1/3, ¼. • Write a program to calculate overtime pay of 10 employees. Overtime is paid at the rate of • Rs.12.00 per hour for every hour worked above 40 hours. Assume that employee do not work for fractional part of an hour • Write a function reverse to reverse a list without using the reverse function.		

	2	**Case study(Examples):** ● Design a basic calculator application in Python that can perform addition, subtraction, multiplication, and division. ● Analysis of Antibiotic Resistance - Utilize publicly available datasets on antibiotic resistance in bacteria. Use NumPy to perform basic statistical analysis, such as calculating mean, median, and standard deviation of minimum inhibitory concentrations (MICs) for different antibioticss		

Reference Books:

1. Downey, A. et al., How to think like a Computer Scientist: Learning with Python, John Wiley,2015

2. Lambert K. A., Fundamentals of Python - First Programs, Cengage Learning India, 2015

3. Sprankle , M., Problem Solving & Programming Concepts, Pearson India

Mapping of COs with PSOs and POs :

	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PO 1	PO2	PO3	PO4	PO5	PO6
CO 1	-	1	2	3	2	2						
CO 2	-	1	2	2	-	-						
CO 3	-	-	2	3	2	2						
CO 4	-	-	2	2	3	3						
CO 5	-	-	3	3	3	3						
CO 6	-	-	2	3	3	3						

Correlation Levels:

Level	Correlation
-	Nil
1	Slightly / Low
2	Moderate / Medium
3	Substantial / High

Assessment Rubrics:

- Quiz / Assignment/ Quiz/ Discussion / Seminar
- Midterm Exam
- Programming Assignments (20%)
- Final Exam (70%)

Mapping of COs to Assessment Rubrics :

	Internal Exam	Assignment	Project Evaluation	End Semester Examinations
CO 1	✓			✓
CO 2	✓	✓	✓	✓
CO 3	✓		✓	✓
CO 4	✓	✓	✓	✓
CO 5	✓			✓
CO 6	✓			✓

Programme	B. Sc. Computer Science				
Course Code	CSC1MN107				
Course Title	**Computer Hardware Assembly**				
Type of Course	**Minor**				
Semester	I				
Academic Level	100 - 199				
Course Details	Credit	Lecture per week	Tutorial per week	Practical per week	Total Hours
	4	3	-	2	75
Pre-requisites	Basic understanding of computer operation No previous experience in hardware assembly required				
Course Summary	Students will learn about the different components of a computer system, how they work together, and the skills necessary to assemble and maintain computer hardware effectively				

Course Outcomes (CO):

CO	CO Statement	Cognitive Level*	Knowledge Category#	Evaluation Tools used
CO1	A comprehensive understanding of fundamental concepts in Computer Organization and Hardware	U	C	Instructor-created exams / Assignment
CO2	Students will be able to understand and identify computer hardware components	Ap	P	Viva Voce
CO3	Students will be able to proficiently assemble computer hardware components adhering to industry standards and best practices.	C	P	Practical / Group Work
CO4	Students will learn to install and configure various operating systems (e.g., Windows, Linux) and drivers on	C	C	Practical / Group Work

	newly assembled computer systems			
CO5	Students will acquire the skills to diagnose and troubleshoot common hardware issues encountered during computer assembly	E	P	Practical/Exam/ Assignments
CO6	Students will develop the skills to perform hardware upgrades	C	P	Practical / Group Work
* - Remember (R), Understand (U), Apply (Ap), Analyse (An), Evaluate (E), Create (C) # - Factual Knowledge(F) Conceptual Knowledge (C) Procedural Knowledge (P) Metacognitive Knowledge (M)				

Detailed Syllabus:

Module	Unit	Content	Hrs	Marks
I	**Basic Computer Organization and Concept of Hardware**		**11**	**17**
	1	Basic Computer Organization: Input Unit, Storage Unit, Processing Unit, Control Unit, Output Unit	1	
	2	CPU Architecture: Arithmetic and Logic Unit, Control unit, Registers	1	
	3	Memory: Primary Memory, Secondary Memory	1	
	4	Access Time, Storage Capacity-bit, byte, nibble	1	
	5	Cache memory, Primary Memory- RAM (Static , Dynamic), ROM	2	
	6	Secondary Memory, storage devices (Magnetic tape, Hard disk , SSD and CD drive). Memory hierarchy.	**3**	
	7	Input and Output Devices	2	
II	**Hardware Components**		**12**	**18**
	8	Concept of Hardware and Software	1	
	9	Microprocessor, Clock Speed and Performance, Types of processors (Single core, dual core, multi core), GPU	2	

	10	Inside CPU: SMPS, Motherboard, Processor, Storage Devices (HDD, SSD), RAM (DDR2, DDR3, DDR4), ROM	2	
	11	Motherboard Components: Processor Slot, Cooling Fan, RAM, Expansion Slots (PCIe), Mouse and Keyboard Ports, Chipset, BIOS/UEFI Chip, SATA/NVMe Slots, Network Interface, Ports- Ethernet, VGA port, HDMI port, USB port	3	
	12	Cables and Connectors,	2	
	12	Expansion Cards: Graphics card, Sound Card, Network Interface Card	1	
III	**Hardware Assembling**		**10**	**17**
	14	**Safety and Tools**: Introduction to ESD (Electrostatic Discharge) safety, use of antistatic wrist straps, and essential tools for assembling hardware	1	
	15	**Assembling a PC**: Step-by-step guide on assembling a PC, including installing processor onto the motherboard, Setup Cooling Fan, Install RAM, Install other expansion cards, Mounting the motherboard into the case and Install storage devices (HDD, SSD) into drive bays, Install the GPU into the appropriate PCIe slot (if not integrated into the CPU)	4	
	16	**Cable Management**: Best practices for managing cables within a PC case to ensure optimal airflow and aesthetics. Connect power supply cables to the motherboard, CPU, GPU, and storage devices, Connect case cables (power switch, reset switch, LEDs, USB ports) to the appropriate headers on the motherboard,	3	
IV	**System Configuration, OS Installation, trouble Shooting**		**12**	**18**
	17	**BIOS and UEFI**: Understanding the roles of BIOS and UEFI navigating BIOS settings, and configuring hardware.	2	
	18	**Installing and Configuring Operating Systems**: Guidelines for installing operating systems (Windows, Linux)	2	
	19	**Installing Drivers**: install drivers for motherboard components (Chipset, LAN, Audio), GPU, and other peripherals.	2	
	20	**Hardware Upgrades**: How to upgrade components such as RAM, storage, and GPUs, including compatibility considerations.	2	
	21	**Troubleshooting Common Assembly Issues**: Identifying and resolving common issues encountered during PC assembly	2	
	22	**Diagnostics and Maintenance:** Introduction to methods, tools and software used for diagnosing hardware issues.	2	

V		Hands-on Hardware Assembling Practical Applications, Case Study and Course Project	30	
	1	**1: Identifying Computer Components** ● Identify and describe the function of the CPU, RAM, motherboard, PSU, storage devices, and peripheral connectors. ● Disassemble and reassemble a desktop computer, identifying each component as it is removed and replaced. **2: Building a PC from Scratch** ● Use appropriate tools and safety equipment to assemble a computer, including installing the motherboard, CPU, CPU cooler, RAM, and storage. ● Practice cable management to ensure a neat and efficient build. ● Document each step of the assembly process for future reference and learning. **3: Operating System Installation and Configuration** ● Install a chosen operating system (e.g., Windows, Linux) from a bootable USB drive or DVD. ● Install essential drivers and software updates. ● Configure basic settings (user accounts, network settings, display resolution). **Case Study: Trouble Shooting and Maintenance**	25 5	

References

1. Pradeep K. Sinha and Priti Sinha, Computer Fundamentals: Concepts, Systems & Applications. BPB Publications.
2. Bigelow's Troubleshooting, Maintaining & Repairing PCs Hardcover – by Stephen Bigelow
3. Kevin Wilson, Computer Hardware: The Illustrated Guide to Understanding Computer Hardware. Amazon Digital Services LLC – KDP, 2018.

Mapping of COs with PSOs and POs:

	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PO1	PO2	PO3	PO4	PO5	PO6
CO 1	1	2	-	-	-	-						
CO 2	-	2	-	-	-	-						
CO 3	-	2	-	-	1	-						
CO 4	-	2	-	-	-	-						
CO 5	-	2	-	-	1	-						
CO 6	-	2	-	-	1	-						

Correlation Levels:

Leve l	Correlation
-	Nil
1	Slightly / Low
2	Moderate / Medium
3	Substantial / High

Assessment Rubrics:

Quiz / Assignment/ Quiz/ Discussion / Seminar
Midterm Exam
Programming Assignments (20%)
Final Exam (70%)

Mapping of COs to Assessment Rubrics:

	Internal Exam	Assignment	Project Evaluation	End Semester Examinations
CO 1	✓	✓		✓

CO 2	✓	✓		✓
CO 3	✓	✓		✓
CO 4	✓	✓		✓
CO 5	✓	✓		✓
CO 6	✓	✓		✓

Programme	B. Sc. Computer Science				
Course Code	CSC2MN107				
Course Title	**Exploring Cyber security in social media**				
Type of Course	**Minor**				
Semester	II				
Academic Level	100-199				
Course Details	Credit	Lecture per week	Tutorial per week	Practical per week	Total Hours
	4	3	-	2	75
Pre-requisites	1. Fundamentals of Computer science				
Course Summary	Students can investigate the complex interplay between social media and cyber security with this minor programme. The course will explore the different risks, vulnerabilities, and dangers related to social media platforms, providing participants with valuable knowledge on how to safeguard both individuals and organisations. Students will get a thorough grasp of cyber security principles as they relate to social media through a combination of academic study, hands-on activities, and case analysis.				

Course Outcomes (CO):

CO	CO Statement	Cognitive Level*	Knowledge Category#	Evaluation Tools used
CO1	Understand the idea of cyber security as well as the problems and difficulties that surround it.	U	F	Instructor-created exams / Quiz
CO2	Understand the cyber crimes, their nature, legal remedies and as to how report the crimes through available platforms and procedures	U	C	Practical Assignment / Observation of Practical Skills
CO3	Understand the privacy and security issues associated with using online social media. They should also be aware of the best practices for using social media platforms, the legal ramifications, and how to report incorrect content.	U	F	Seminar Presentation / Group Tutorial Work/ Viva Voce

CO4	Understand ethical standards related to usage of social media and apply those ethical standards in their day today life usage.	U	C	Instructor-created exams / Home Assignments
CO5	Comprehend the fundamentals of computer and mobile security and will be able to safeguard their gadgets with simple tools and technology.	Ap	P	Writing assignments/ Instructor-created exams/ practicals
CO6	Develop a cybersecurity plan for a hypothetical social media.	Ap	P	Case Study/ mini Project/ practicals
* - Remember (R), Understand (U), Apply (Ap), Analyse (An), Evaluate (E), Create (C) # - Factual Knowledge(F) Conceptual Knowledge (C) Procedural Knowledge (P) Metacognitive Knowledge (M)				

Detailed Syllabus:

Module	Unit	Content	Hrs (45+30)	Marks (70)
I	**Introduction to Cyber security & History of Internet and social media**		**9**	**12**
	1	Historical overview of social media development	2	
	2	Impact of social media	1	
	3	Internet, World wide web, Introduction of the internet	2	
	4	Internet infrastructure for data transfer and governance	2	
	5	Terminologies like anti-virus, firewall, Wi-Fi network	2	
II	**Introduction Cyber Security & reporting of cyber crimes**		**12**	**15**
	6	Concept of cyber security, Issues and challenges of cyber security Terminologies: Cyber Security, Cyber Crime, Cyber Attack, Cyber Espionage, Cyber Warfare	2	
	7	Classification of cyber crimes : Financial crimes: Online fraud, phishing, identity theft (basic concepts only)	2	
	8	Cyber crime targeting computers and mobiles	2	
	9	Cyber crime against women and children, social engineering attacks, malware and ransomware attacks	2	
	10	Reporting of cyber crimes,	2	

	11	Legal perspective of cyber crime, IT Act 2000 and its amendments, Cyber crime and offences	2	
III	**Introduction to Social Media**		**12**	**15**
	12	Introduction to Social networks. Types of Social media, Social media platforms	2	
	13	Social media monitoring, Hashtag, Viral content	3	
	14	Social media marketing	2	
	15	Social media privacy, Challenges, opportunities and pitfalls in online social network	2	
	16	Security issues related to social media: Phishing Attacks, Account take over, Data breeches, Fake Accounts and Impersonation, Credential Stuffing, Doxing (concepts only)	3	
IV		**Cyber Security in social media**	**12**	**20**
	17	End Point device and Mobile phone security, Password policy	1	
	18	Data backup, Downloading and management of third party software	2	
	19	Cyber Security best practices, Significance of host firewall and Ant-virus, Management of host firewall and Anti-virus,	2	
	20	Wi-Fi security, Configuration of basic security policy and permissions.	1	
	21	Terminologies like- strong password, Two-Factor Authentication, Login Activity Monitoring, Authorized Devices	3	
	22	Ethical dilemmas in social media usage: Privacy vs. Transparency, Authenticity vs. Self-Presentation, Misinformation vs. Truthfulness, Cyberbullying and Online Harassment, Data Privacy and User Consent, Influence and Manipulation, Addiction & Mental Health	3	
V	**Practical Implementations of Cyber security in social media**		**30**	**20**
	1	● Setting, configuring and managing three password policy in the computer (BIOS, Administrator and Standard User). ● Setting and configuring two factor authentication in the Mobile phone. ● Security patch management and updates in Computer and Mobiles. ● Managing Application permissions in Mobile phone. ● Installation and configuration of computer Anti-virus.	20	

		● Installation and configuration of Computer Host Firewall.		
		● Wi-Fi security management in computer and mobile. ● Hands-on exercises with social media monitoring tools		
	2	Develop a cybersecurity plan for a hypothetical social media scenario (Capstone) Organisations dealing with Cyber crime and Cyber security in India, Case studies.	10	

References

- "Social Media Security: Leveraging Social Networking While Mitigating Risk" by Michael Cross
- "The Social Media Security Playbook: Your Guide to Stopping Threats, Plugging Gaps, and Responding to Emergencies" by Christopher Hadnagy and Michele Fincher
- Cyber Security Understanding Cyber Crimes, Computer Forensics and Legal Perspectives by Sumit Belapure and Nina Godbole, Wiley India Pvt. Ltd. (First Edition, 2011)
- Security in the Digital Age: Social Media Security Threats and Vulnerabilities by Henry A. Oliver, Create Space Independent Publishing Platform. (Pearson , 13th November, 2001)
- Fundamentals of Network Security by E. Maiwald, McGraw Hill.

Mapping of COs with PSOs and POs :

	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PO1	PO2	PO3	PO4	PO5	PO6
CO 1	-	2	-	-	-	-						
CO 2	-	1	-	-	-	-						
CO 3	-	2	-	-	-	-						
CO 4	-	2	-	-	-	-						

CO 5	-	1	-	-	-	-						
CO 6	-	1	1	-	-	-						

Correlation Levels:

Leve l	Correlation
-	Nil
1	Slightly / Low
2	Moderate / Medium
3	Substantial / High

Assessment Rubrics:

Quiz / Assignment/ Quiz/ Discussion / Seminar
Midterm Exam
Programming Assignments (20%)
Final Exam (70%)

Mapping of COs to Assessment Rubrics :

	Internal Exam	Assignment	Practical Evaluation	End Semester Examinations
CO 1	✓	✓	✓	✓
CO 2	✓	✓	✓	✓
CO 3	✓	✓	✓	✓
CO 4	✓	✓	✓	✓
CO 5	✓	✓	✓	✓
CO 6	✓	✓	✓	

Programme	B. Sc. Computer Science Minor
Course Code	CSC3MN107
Course Title	**Emerging Trends in Computer Science**
Type of Course	**Minor**
Semester	III

Academic Level	200-299				
Course Details	Credit	Lecture per week	Tutorial per week	Practical per week	Total Hours
	4	3	-	2	75
Pre-requisites	1. Knowledge in Computers. 2. Basic knowledge in Internet				
Course Summary	This course provides an overview of the latest trends and advancements in the field of computer science. Students will explore emerging technologies, methodologies, and research areas shaping the future of computing.				

Course Outcomes (CO):

CO	CO Statement	Cognitive Level*	Knowledge Category#	Evaluation Tools used
		U	C	
CO1	Analyze real-world use cases and applications of emerging technologies, identifying opportunities and challenges for innovation and problem-solving in areas such as healthcare, finance, smart cities, and industry.	An	C	
CO2	Understand the fundamental concepts of artificial intelligence (AI), and applications across various domains.	U	C	
CO3	Identify the key components of a block chain network, such as nodes, blocks, transactions, and smart contracts.	Ap	C	
CO4	Understand the fundamental concepts of computer networks and popular applications	U	C	

CO5	Identify the key components of a block chain network and applications	Ap	C	
CO6	Understand the evolution of database management systems (DBMS) from traditional modern .	U	C	
CO7	Describe the features of NoSQL databases and their advantages over traditional relational databases.	Ap	C	

* - Remember (R), Understand (U), Apply (Ap), Analyse (An), Evaluate (E), Create (C)

- Factual Knowledge(F) Conceptual Knowledge (C) Procedural Knowledge (P) Metacognitive Knowledge (M)

Detailed Syllabus:

References:

Module	Unit	Content	Hrs	Marks(70)
I	**Basic concepts of Artificial Intelligence and Machine Learning**		12	**20**
	1	Concept of Machine Learning and Artificial Intelligence: Definition, Evolution	2	
	2	Types Of Machine Learning: Supervised learning, Unsupervised learning, Reinforcement learning, Evolutionary learning	3	
	3	Common ML algorithms: Regression, Classification, Clustering. (Concepts)	3	
	4	The Machine Learning Process: Data Collection and Preparation, Feature Selection , Algorithm Choice , Parameter and Model Selection , Training , Evaluation	2	
	5	Application of Machine Learning: Healthcare, Finance, Self Driving Cars, Robotics	2	
II	**Introduction to Block chain Technology:**		**12**	**20**
	6	Cryptography Overview: Definition, Types of Cryptography -Public and Private Keys, Application -Digital Signature	3	

	7	Introduction to Block chain Technology: History of Block chain, Generic Elements of Block chain, Features of Block chain(Decentralization, Transparency , Immutability and Security)	2	
	8	Types of Block chain:	2	
	9	Applications of Bock chain Technology : Financial Services, Supply Chain Management, Smart Contracts	2	
	10	Crypto currencies: Definition, Bit coin, Ethereum	2	
	11	Challenges in Block chain Adoption: Scalability, interoperability, and regulatory concerns, Security considerations.	1	
III	**IOT and Cloud Technology**		**10**	**15**
	12	Overview of Computer Networks: Definition, types, and importance.	2	
	13	Network Design Concepts: ISO/OSI and TCP/IP	2	
	14	Networking Devices and Protocols: Routers, switches, Hub, Modems, TCP, UDP, IP.	2	
	15	Cloud Computing and Services: Infrastructure as a Service (IaaS), Platform as a Service (PaaS), and Software as a Service (SaaS).	2	
	16	Internet of Things: Definition, Key characteristic, Architecture and components, Challenges and Security in IOT.	2	
IV	**Unstructured Database**		**10**	**15**
	17	Overview of traditional DBMS: Relational, Object-Oriented Database	3	
	18	Structured and Unstructured Database	1	
	19	Introduction to NoSQL databases	2	
	20	Types of NoSQL databases (Document-oriented, Key-value stores, Column-family stores, Graph databases)		
	21	Cloud-Based Database Services: Database as a Service (DBaaS) overview, Benefits of cloud-based solutions	2	

	22	Block chain Databases (2 hours): Understanding graph databases and their applications, Overview of Block chain databases and their role in data integrity.	2	

	Practical Applications, Case Study		**30**	
	1	1. Identify the various software platforms for AI programming.		
		2. Identify the various platforms used for No-Code AI.(Google Cloud Auto ML, Microsoft Azure Al Buildeer, IBM Watson Studio etc..)		
		3. Use chatbot platforms like ChatGPT or any other to engage in conversational interactions and understand how natural language processing works.		
		4.Use online tools or any applications that demonstrate image recognition capabilities.		
		5.Use online platforms or software that provide interactive AI demos and simulations, such as neural network visualisers or AI-powered character generators.		
		6.Use an online tool like CyberChef or an online RSA key generator to generate a pair of RSA public and private keys.		
		7. Create a digital signature for a given document using an online service like DocuSign or HelloSign, and verify it using the service's verification features.		
		8. Use online resources to create a comparison table for public, private, and consortium blockchains, including real-world examples.		
		9. Use MySQL or PostgreSQL to create a database, define tables, and perform CRUD operations.		
		10.Use db4o (Database for Objects) or an equivalent tool to create and manipulate an object-oriented database.		
		11. Use MongoDB to store and query unstructured data.		
		12. Use MongoDB to create a collection and perform CRUD operations.		
		13. Deploy and interact with a cloud-based database service.		
		14. Explore and implement a basic blockchain database using an appropriate platform.		
		15. Use BigchainDB or a similar blockchain database platform to create a blockchain database.		

1. “Explorations in Artificial Intelligence and Machine Learning” - By Roberto Zicari
2. “Blockchain Fundamentals”- Dr. Ravindhar Vadapalli
3. "Cloud Computing: Concepts, Technology & Architecture" by Thomas Erl, Ricardo Puttini, and Zaigham Mahmood
4. Michael Miller, “The Internet of Things: How Smart TVs, Smart Cars, Smart Homes, and Smart Cities Are Changing the World”, Pearson Education 2015
5. “A Brief Guide to the Emerging World of Polyglot Persistence:- By Pramod J. Sadalage, Pramod Sadalage, Martin Fowler

Mapping of COs with PSOs and POs :

	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PO1	PO2	PO3	PO4	PO5	PO6
CO 1	-	-	1	-	-	3						
CO 2	-	2	1	-	2	3						
CO 3	-	2	1	-	2	3						
CO 4	-	2	1	-	2	3						
CO 5	-	2	1	-	2	3						
CO 6	-	2	1	-	2	3						
CO7	-	-	1	-	-	3						

Correlation Levels:

Level	Correlation
-	Nil
1	Slightly / Low
2	Moderate /
	Medium
3	Substantial / High

Assessment Rubrics:

Quiz / Assignment/ Quiz/ Discussion / Seminar
Midterm Exam
Programming Assignments (20%)
Final Exam (70%)

Mapping of COs to Assessment Rubrics :

	Internal Exam	Assignment	Project Evaluation	End Semester Examinations
CO 1	✓			✓
CO 2	✓			✓
CO 3	✓	✓		✓
CO 4		✓		✓
CO 5		✓		✓

Detailed Syllabus of Vocational Minors

VOCATIONAL MINOR

Programme	BSc Computer Science
Course Code	CSC1VN101

Course Title	Computational Mathematics in Data Science				
Type of Course	Vocational Minor				
Semester	I				
Academic Level	100-199				
Course Details	Credit	Lecture per week	Tutorial per week	Practical per week	Total Hours
	4	3	-	2	75
Pre-requisites	Basic Mathematics is required (Algebra, Arithmetic)				
Course Summary	This course provides a fundamental exploration of mathematical concepts essential for computer science. Students will explore into key topics including Linear Algebra, Differential and Integral Calculus. The course aims to equip students with the mathematical tools and reasoning skills necessary for creating and analyzing algorithms, understanding and solving computational problems in various areas of computer science Data science, Artificial Intelligence.				

Course Outcomes (CO):

CO	CO Statement	Cognitive Level*	Knowledge Category#	Evaluation Tools used
CO1	Reflect the concept of matrices and determinants as a way to depict and streamline mathematical ideas to perform basic operations.	U	C	Instructor- create exams / Quiz/Assignment/ Seminar
CO2	Able to find the inverse of square matrices using different methods and demonstrate a solid understanding of eigen values.	U	C	Instructor-created exams/ Quiz/Assignment/ Seminar
CO3	Proficiency in solving linear equations using different techniques and understanding the geometric interpretation of solutions.	U	C	Instructor-created exams/ Quiz/Assignment/ Seminar
CO4	Gain proficiency in representing vectors geometrically and algebraically, understanding vector addition, dot and cross products.	U	C	Instructor-created exams/ Quiz/Assignment/ Seminar
CO5	Able to apply differential and integral calculus to various functions encountered in data science such as polynomials, exponentials and logarithmic functions.	U	C	Instructor-created exams/ Quiz/Assignment/ Seminar

CO6	Represent various mathematical problems using algorithmic approaches and enhance problem-solving skills by visualizing solutions through the utilization of software tools.	U, Ap	C, P	Practical Assignment / Observation of Practical Skills
* - Remember (R), Understand (U), Apply (Ap), Analyse (An), Evaluate (E), Create (C) # - Factual Knowledge(F) Conceptual Knowledge (C) Procedural Knowledge (P) Metacognitive Knowledge (M)				

Detailed Syllabus

Module	Unit	Contents	Hrs (45+30)	Mark
I		**Matrices and Determinants**	**13**	**18**
	1	Matrices: Definition, Order of a matrix, Types of matrices	1	
	2	Operations on matrices: Addition, Subtraction, Multiplication	3	
	3	Properties of matrix: Various kind of Matrices, Transpose of a matrix	2	
	4	Elementary Transformations of Matrices and Rank of Matrices	2	
	5	Symmetric and Skew Symmetric Matrices	2	
	6	Determinants, Minors, Cofactors, Inverse of a matrix	3	
II		**Linear Algebra and Vector Calculus**	**11**	**18**
	7	Linear Independence: Characteristic equations,	1	
	8	Eigen values, Eigen Vector	2	
	9	Solving system of linear equations: Gauss Elimination Method, Gauss Jordan method, Gauss Siedel Methods	3	
	10	Vectors: Definition Magnitude of a vector, Types of Vectors, Vector addition	2	
	11	Dot products and Cross products	2	
	12	Vectors in 2- and 3-space	1	
III		**Differentiation**	**10**	**17**
	13	Limits; Definition (concept only), Derivative of a Point, Derivative at Function	2	

	14	Differentiation: Definition, Differentiation from first principle, Differentiation of important function	2	
	15	Product rule, Quotient rule	3	
	16	Derivative of function of a function	2	
	17	Logarithmic differentiation	1	
IV	**Integration**		**11**	**17**
	18	Integration: Integral as Anti-derivative, Indefinite integral & constant of integration	2	
	19	Fundamental theorems, Elementary Standard results	2	
	20	Integral of different functions, Integration by Substitution	3	
	21	Definite Integrals, Properties of definite integrals	2	
	22	Evaluation of Definite Integrals by Substitution	2	
V	**Lab Activities (Use Sci Lab or any other Alternative tools)**		**30**	
		1. Create and display a m x n order matrix. 2. Perform addition of two matrices. 3. Perform multiplication of two matrices. 4. Find the Determinant of a n x n matrix. 5. Read and display a polynomial of degree n. 6. Find the dot product of two given vectors. 7. Find the cross product of two given vectors. 8. Find the eigen values of a n x n matrix. 9. Find the derivative of a polynomial with degree n. 10. Find the integral of a polynomial with degree n having limits a and b.	30	

Mapping of COs with PSOs and POs:

	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PO1	PO2	PO3	PO4	PO5	PO6
CO 1	1	-	1	1	-	-						
CO 2	2	-	2	2	-	-						
CO 3	2	-	2	2	-	-						
CO 4	2	-	2	2	-	-						
CO 5	2	-	2	2	-	-						
CO 6	2	-	2	2	-	-						

Correlation Levels:

Level	Correlation
-	Nil

137

1	Slightly / Low
2	Moderate / Medium
3	Substantial / High

Assessment Rubrics:

- Quiz / Assignment/ Discussion / Seminar
- Midterm Exam
- Programming Assignments (20%)
- Final Exam (70%)

Mapping of COs to Assessment Rubrics:

	Internal Exam	Assignment	Practical Evaluation	End Semester Examinations
CO 1	✓	✓		✓
CO 2	✓	✓		✓
CO 3	✓	✓		✓
CO 4	✓	✓		✓
CO 5	✓	✓		✓
CO 6	✓	✓	✓	✓

References:

1. Advanced Engineering Mathematics, Erwin Kreyszig, Wiley
2. Higher Engineering Mathematics, John Bird, Elsevier Direct
3. Skills in Mathematics: Algebra, S.K.Goyal
4. Higher Engineering Mathematics, B S Grewal, Khanna Publishers
5. Higher Engineering Mathematics, Ramana, Tata McGraw Hill
6. Engineering Mathematics, P Kandasamy, S. Chand Group

7. Gilbert Strang, “Introduction to Linear Algebra”, Wellesley-Cambridge Press, 2023.

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Programme	BSc Computer Science				
Course Code	CSC2VN101				
Course Title	Introduction to Data Science				
Type of Course	Vocational Minor				
Semester	II				
Academic Level	100-199				
Course Details	Credit	Lecture per week	Tutorial per week	Practical per week	Total Hours
	4	3	-	2	75
Pre-requisites	1. Basic understanding of computer science concepts. 2. Familiarity with data handling. 3. simple mathematical analysis.				
Course Summary	Data science is the domain of study that deals with vast volumes of data using modern tools and techniques to find unseen patterns, derive meaningful information, and make business decisions.				

Course Outcomes (CO):

CO	CO Statement	Cognitive Level*	Knowledge Category#	Evaluation Tools used
CO1	Identify the relevance and applications of computers in other disciplines with various data science applications.	R	C	Assignment / Instructor-created exams / Quiz
CO2	understanding of data science concepts and be capable of applying data science skills and interpret data science results	U	C	Assignment / Instructor-created exams / Quiz
CO3	Acquire logical thinking about evolution of data science	U	C	Assignment / Instructor-created exams / Quiz

CO4	How to use tools for acquiring, cleaning, analyzing, exploring, and visualizing data	Ap	P	Assignment / Instructor-created exams / Quiz
CO5	Learn to make data-driven inferences and decisions	Ap	P	Assignment / Instructor-created exams / Quiz
CO6	Able to perform data science processing, such as data import, data analysis, data visualization, and data modelling	Ap	P	Assignment / Instructor-created exams / Quiz

* - Remember (R), Understand (U), Apply (Ap), Analyse (An), Evaluate (E), Create (C)
# - Factual Knowledge(F) Conceptual Knowledge (C) Procedural Knowledge (P) Metacognitive Knowledge (M)

Detailed Syllabus

Module	Unit	Content	Hrs (45+30)	Mark
I	**Introduction to Data Science**		**10**	**15**
	1	Introduction to Data Science-Definition	2	
	2	Evolution of Data Science	2	
	3	Data Science Roles	3	
	4	Application of data sciences.	3	
II	**Data Collection and Data Pre-Processing**		**10**	**15**
	5	Data Collection Strategies	1	
	6	Data Pre-Processing Overview	2	
	7	Data Cleaning	2	
	8	Data Integration and Transformation	3	
	9	Data Reduction and Descretization	2	
III	**Data Analytics**		**12**	**20**
	10	Descriptive Statistics	2	
	11	Mean, Standard Deviation	2	
	12	Skewness and Kurtosis	2	
	13	Box Plots	2	
	14	Pivot Table	2	
	15	Correlation Statistics	2	
IV	**Data Model Devolopment and Evaluation**		**13**	**20**
	16	Simple and Multiple Regression	2	
	17	Model Evaluation using Visualization	2	
	18	Residual plot and distributional plot	2	
	19	Prediction and Decision Making	2	
	20	Model Evaluation techniques-	3	

	21	Supervised learning techniques	1	
	22	unsupervised learning techniques	1	
V	**Practical: Introduction to data analysis tools in Python** • Working with Pandas data frames • Basic plots using Matplotlib • Frequency distributions • Averages • Correlation and scatter plots • Correlation coefficient • Regression		**30**	

Mapping of COs with PSOs and POs:

	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PO1	PO2	PO3	PO4	PO5	PO6
CO 1	3	-	1	-	2	-						
CO 2	3	-	1	-	1	-						
CO 3	3	-	2	-	1	-						
CO 4	2	-	2	-	2	-						
CO 5	1	-	2	-	2	-						
CO 6	1	-	2	1	2	-						

Correlation Levels:

Level	Correlation
-	Nil
1	Slightly / Low
2	Moderate / Medium
3	Substantial / High

Assessment Rubrics:

- Quiz / Assignment/ Quiz/ Discussion / Seminar
- Midterm Exam
- Programming Assignments (20%)
- Final Exam (70%)

Mapping of COs to Assessment Rubrics:

	Internal Exam	Assignment	Practical Evaluation	End Semester Examinations
CO 1	✓	✓		✓
CO 2	✓	✓		✓

CO 3		✓	✓	✓
CO 4		✓	✓	✓
CO 5		✓	✓	✓
CO 6	✓	✓		✓

Text books:

1. Jojo Moolayil, “Smarter Decisions : The Intersection of IoT and Data Science”, PACKT, 2016.

2. Cathy O’Neil and Rachel Schutt , “Doing Data Science”, O'Reilly, 2015.

3. David Dietrich, Barry Heller, Beibei Yang, “Data Science and Big data Analytics”, EMC 2013

4. Introduction to Data Science a Python approach to concepts, Techniques and Applications, Igual, L;Seghi’, S. Springer, ISBN:978-3-319-50016-4 2.

5. Data Analysis with Python A Modern Approach, David Taieb, Packt Publishing, ISBN-9781789950069

Programme	B. Sc. Computer Science				
Course Code	CSC3VN201				
Course Title	Data Analysis and Visualisation Using Spreadsheets				
Type of Course	Vocational Minor				
Semester	III				
Academic Level	200-299				
Course Details	Credit	Lecture per week	Tutorial per week	Practical per week	Total Hours
	4	3	-	2	75
Pre-requisites	• Basic understanding of computers • Familiarity with basic mathematical operations				
Course Summary	This course provides a comprehensive introduction to Spreadsheets, focusing on understanding formulas, functions, data organization, analysis techniques, and data visualization. Participants will gain skills in spreadsheet management, data cleansing, analysis, and visualization using Excel's various tools and features.				

Course Outcomes (CO):

CO	CO Statement	Cognitive Level*	Knowledge Category#	Evaluation Tools used
CO1	Students will demonstrate proficiency in managing spreadsheets, including creating, formatting, and manipulating data within Excel workbooks. They will be able to effectively navigate Excel's interface and utilize toolbars.	U	P	Instructor- created exams / Quiz
CO2	Learners will understand the importance of data organization and cleansing in Excel. They will be able to import, export, filter, sort, validate, and remove duplicates from datasets. Students will develop skills to ensure data integrity and consistency, enhancing their ability to work with clean and organized data sets.	U	P	Instructor- created exams/ Home Assignments

CO3	Participants will acquire advanced data analysis skills like pivot tables, what-if analysis, and goal seek. They will be able to apply various Excel functions and tools to perform complex calculations, analyze trends, and make informed	Ap	P	Instructor- created exams
	decisions based on data analysis.			
CO4	Students will gain proficiency in data visualization techniques using Excel. They will be able to create a variety of charts, design pivot charts, dashboards for effective data analysis. Additionally, learners will be able to implement form controls for interactive data manipulation in their visualizations.	Ap	P	Instructor-created exams
CO5	Learners will develop skills in advanced features of Excel like macros, protect data sheets and workbooks, utilize split, freeze, and hide options effectively, incorporate add-ins for extended functionalities, and manage printing options in Excel for professional presentation of data.	Ap	P	Instructor-created exams
* - Remember (R), Understand (U), Apply (Ap), Analyse (An), Evaluate (E), Create (C) # - Factual Knowledge(F) Conceptual Knowledge (C) Procedural Knowledge (P) Metacognitive Knowledge (M)				

Detailed Syllabus:

Module	Unit	Content	Hrs (45)	Marks (70)
I	**Introduction to Excel & Understanding Formulas, Functions**		**10**	**15**
	1	Features of Spreadsheet	1	
	2	Parts of Excel Window, Toolbars, Worksheet and Workbook, Insertion and Deletion of cells, columns, rows	2	
	3	Formatting in Excel (Merge, Warp, Font Formatting, Number Formatting, Borders and Shading, Colouring)	2	
	4	Range, Autofill, Autosum, Relative, Absolute and Mixed Referencing in Excel, Linking data between worksheets	2	

	5	Formulas and Functions in Excel: Use of Formula Bar, Functions: SUM, ROUND, CEIL, FLOOR, IF, AND, OR, AVERAGE, MIN, MAX ,COUNT, COUNTIF, SUMIF, VLOOKUP,HLOOKUP	3	
II	**Cleansing and Organising Data in Excel**		**10**	**10**
	6	Importance of Data Cleansing and Organisation	1	
	7	Data Import and Export	2	
	8	Filtering and Sorting	2	
	9	Data Validation and removal of duplicates	2	
	10	Group, Ungroup, Subtotal	2	
	11	Conditional Formatting – Highlight Cell Rules, Top/Bottom Rules	1	
III	**Advanced Techniques for Data Analysis**		**14**	**10**
	12	Features of Pivot table	1	
	13	Pivot Table creation	2	
	14	Fitting Linear regression in Excel	3	
	15	Linear regression using Excel formulas	3	
	16	Interpreting regression results	2	
IV	**Data Visualisation Techniques**		**14**	**15**
	17	Creating Charts, Different types of charts	2	
	18	Formatting Chart Objects, Changing the Chart Type, Showing and Hiding the Legend, Showing and Hiding the Data Table	2	
	19	Creating charts from regression	2	
	20	Pivot Chart	2	
	21	Dashboards	2	
	22	Form Controls	4	
V	**Hands-on Spreadsheets**		**30**	**30**
	Spreadsheet Basics: 1. Create a new workbook in Excel. 2. Identify and label different parts of the Excel window, such as the Ribbon, Formula Bar, Name Box, and Worksheet Tabs. 3. Insert and delete cells, columns, and rows within a worksheet.			
	Formatting: 4. Merge cells and wrap text within merged cells. 5. Experiment with different font styles, sizes, and colors for text formatting. 6. Apply various number formatting options (e.g., currency, percentage, date) to cells. 7. Add borders and shading to cells or ranges.			

	Range Operations: 8. Use Autofill to quickly populate a series of cells with data (e.g., numbers, dates, text). 9. Utilize Autosum to calculate the sum of a range of numbers automatically. 10. Practice relative, absolute, and mixed referencing in formulas to understand their impact on cell references. 11. Link data between different worksheets within the same workbook.		
	Formulas and Functions: 12. Experiment with different mathematical formulas (e.g., addition, subtraction, multiplication, division) using the Formula Bar. 13. Apply common functions such as SUM, ROUND, CEIL, FLOOR, IF, AND, OR, AVERAGE, MIN, MAX, COUNT, COUNTIF, SUMIF, VLOOKUP, and HLOOKUP to solve specific problems or analyze data sets. 14. Combine functions within formulas to perform more complex calculations.		
	Data Import and Export: 15. Import external data from sources such as CSV files, text files, or databases into Excel. 16. Export Excel data to different formats (e.g., CSV, PDF) for sharing or further analysis.		
	Filtering and Sorting: 17. Filter data to display specific records based on criteria (e.g., dates, categories, numerical ranges). 18. Sort data alphabetically, numerically, or chronologically to analyze trends or identify patterns.		
	Data Validation and Removal of Duplicates: 19. Implement data validation rules to restrict input values within specified criteria (e.g., date ranges, numerical limits, list selections). 20. Identify and remove duplicate records from a dataset while preserving unique data entries.		
	Grouping, Ungrouping, and Subtotal: 21. Group related rows or columns together to organize data hierarchically. 22. Perform subtotal calculations within grouped data to summarize information at different levels of detail.		
	Conditional Formatting: 23. Apply conditional formatting using highlight cell rules to visually identify data outliers, trends, or exceptions. 24. Utilize top/bottom rules to highlight top or bottom values within a dataset for quick analysis.		

	Pivot Table Creation: 25. Import a dataset into Excel and create a pivot table summarizing key metrics (e.g., sales revenue, product quantities) by different dimensions (e.g., region, product category). 26. Experiment with different pivot table configurations (e.g., adding calculated fields, grouping data, creating hierarchical rows/columns) to gain insights into the dataset.		
	Fitting Linear Regression in Excel: 27. Import a dataset containing variables for linear regression analysis (e.g., independent and dependent variables). 28. Use Excel's built-in regression analysis tool to fit a linear regression model to the data and calculate coefficients, standard errors, and goodness-of-fit measures.		
	Creating Charts from Regression Analysis: 29. Perform linear regression analysis on a dataset containing independent and dependent variables. 30. Create a scatter plot chart to visualize the relationship between the variables, including the regression line and confidence intervals.		
	Pivot Chart: 31. Create a pivot chart based on a pivot table summarizing key metrics from a dataset. 32. Customize the pivot chart to display data trends and patterns dynamically as the underlying pivot table data is updated.		
	Dashboards: 33. Design a dashboard incorporating multiple charts and pivot tables to provide a comprehensive overview of business metrics or performance indicators. 34. Use interactive features such as slicers and timeline controls to enable users to filter and analyze data dynamically.		
	Form Controls: 35. Add form controls such as checkboxes, dropdown lists, and option buttons to interact with charts and pivot tables.		
	36. Create interactive features allowing users to customize chart views or update data dynamically based on user inputs.		

References

1. "Excel 2019 Bible" by Michael Alexander and Richard Kusleika
2. "Excel Formulas & Functions For Dummies" by Ken Bluttman and Peter Aitken
3. “Excel with Microsoft Excel: Comprehensive & Easy Guide to Learn Advanced MS Excel” by Naveen Mishra

Assessment Rubrics:

- Quiz / Assignment/ Quiz/ Discussion / Seminar
- Midterm Exam

- Final Exam

Programme	BSc. Computer Science				
Course Code	CSC8VN401				
Course Title	Predictive Modelling				
Type of Course	Vocational Minor				
Semester	III				
Academic Level	400-499				
Course Details	Credit	Lecture per week	Tutorial per week	Practical per week	Total Hours
	4	4	-	-	60
Pre-requisites	1. Basic Mathematical Concepts 2. Basic Statistics				
Course Summary	Predictive Modeling gives undergraduate students a solid foundation in predictive analytics techniques essential for data-driven decision-making. The course covers key topics such as correlation, covariance, linear regression, multiple regression, polynomial regression, logistic regression, and time series analysis and forecasting.				

Course Outcomes (CO):

CO	CO Statement	Cognitive Level*	Knowledge Category#	Evaluation Tools used
CO1	Apply correlation and covariance analysis to assess relationships between variables.	Ap	P	Problems/ Projects
CO2	Implement linear, multiple, and polynomial regression models to predict outcomes from numerical data.	Ap	P	Problems/ Projects
CO3	Employ time series analysis techniques to identify trends, and seasonal patterns, and make accurate forecasts.	An	P	Problems/ Projects
CO4	Evaluate model performance and interpret results to inform business decisions.	An	P	Analysis of reports and case studies
CO5	Utilize logistic regression to classify categorical outcomes and make data-driven decisions.	Ap	P	Projects
CO6	Acquire proficiency in building predictive models using real-world datasets	U	C	Assignments/ Quiz

* - Remember (R), Understand (U), Apply (Ap), Analyse (An), Evaluate (E), Create (C) # - Factual Knowledge(F) Conceptual Knowledge (C) Procedural Knowledge (P) Metacognitive Knowledge (M)

Detailed Syllabus:

Module	Unit	Content	Hrs (48)	Marks (70)
I	**Correlation & Covariance**		**8**	**12**
	1	Data types or levels of measurement- Nominal, ordinal, interval and ratio	2	
	2	Covariance sample and population, sign and magnitude of covariance,	1	
	3	The covariance matrix, Covariance vs Correlation	2	
	4	Measures of Correlation, Simple correlation	1	
	5	Partial correlation and Multiple correlations	2	
II	**Regression Techniques**		**12**	**16**
	6	Simple linear regression	2	
	7	Basics of fitting and residual analysis	2	
	8	Multiple linear regression	2	
	9	Gauss Markov theorem	2	
	10	Least Squares Method, ordinary least squares, weighted least squares	2	
	11	Polynomial regression	2	
III	**Logistics Regression**		**11**	**14**
	12	Basics of Logistic regression	2	
	13	Logistic regression with binary predictor	2	
	14	Odds ratio, z-statistic, p-values	3	
	15	Confidence intervals	2	
	16	Logistic regression with categorical predictors	2	
IV	**Time Series analysis and forecasting**		**16**	**28**
	17	Components of time-series, additive and multiplicative models	3	
	18	Methods for measurement of trends	2	
	19	Methods for measurement of seasonal fluctuations	3	
	20	Forecasting, Autocorrelation	2	
	21	ARIMA Model	3	
	22	ARMA Model	3	
V	**Open Ended Module: Assignments, Case study**		**12**	
	1. Provide real-world examples to understand the relationships between variables in data analysis using covariance, correlation 2. Using real examples, understand the difference between different types of correlation. 3. Provide examples for nominal, ordinal, interval, and ratio data types 4. Provide examples of how linear regression is used in various fields such as economics, finance, healthcare, and engineering to analyze relationships between variables and make predictions.		4	

	5. Analyze the relationship between different variables using multiple linear regression. Eg: Health Care analytics: patients' demographics, lifestyle factors, and medical history using multiple linear regression. 6. Analyze the relationship between different variables using logistic regression. Eg: Predict the risk of developing a certain disease (e.g.,	8	
	diabetes, cancer) using logistic regression with binary predictors such as genetic markers, lifestyle factors, and medical history. 7. Analyze the time series model using ARIMA/ ARMA model		

Mapping of COs with PSOs and POs:

	PSO1	PSO 2	PSO 3	PSO 4	PSO 5	PSO6	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6
CO 1	3	-	3	-	-	-						
CO 2	3	-	3	2	-	2						
CO 3	3	-	3	2	-	2						
CO 4	-	-	2	-	-	2						
CO 5	3	-	3	2	-	2						
CO 6	-	-	2	-	-	2						

Correlation Levels:

Level	Correlation
-	Nil
1	Slightly / Low
2	Moderate / Medium
3	Substantial / High

Mapping of COs to Assessment Rubrics:

	Internal Exam	Assignment	Project Evaluation	End Semester Examinations
CO 1	✓	✓	✓	✓
CO 2	✓	✓	✓	✓
CO 3	✓	✓	✓	✓
CO 4	✓		✓	✓
CO 5	✓			✓
CO 6	✓			✓

Assessment Rubrics:

- Quiz / Assignment/ Quiz/ Discussion / Seminar
- Midterm Exam
- Final Exam

References:

1. Fan, Jianqing, et al. Statistical Foundations of Data Science. United States, CRC Press, 2020.
2. Hilbe, Joseph M. Practical Guide to Logistic Regression. United States, CRC Press, 2016.
3. Nielsen, Aileen. Practical Time Series Analysis: Prediction with Statistics and Machine Learning. United States, O'Reilly Media, 2019.
4. Fundamentals of Mathematical Statistics. United Kingdom, Sultan Chand & Sons, 2020.

Programme	BSc. Computer Science				
Course Code	CSC1VN102				
Course Title	Statistical Foundations for Artificial Intelligence				
Type of Course	Vocational Minor				
Semester	I				
Academic Level	100 - 199				
Course Details	Credit	Lecture per week	Tutorial per week	Practical per week	Total Hours
	4	3	-	2	75
Pre-requisites	1. A strong foundation in algebra 2. Fundamentals of Set theory and logic				
Course Summary	The course on probability and statistics covers fundamental topics including descriptive statistics (measures of central tendency and dispersion), probability theory (events, sample spaces, probabilitylaws, random variables, and distributions), inferential statistics (regression analysis), and applications in various fields such as science, engineering, economics, and social sciences, emphasizing critical thinking, data analysis, and problem-solving skills.				

Course Outcomes (CO):

CO	CO Statement	Cognitive Level*	Knowledge Category#	Evaluation Tools used
CO1	Apply fundamental statistics concepts	Ap	C	Quizzes, Homework, Exams
CO2	Analyze data using descriptive statistics	An	P	Projects, Midterm, Exams
CO3	Perform regression analysis	An	P	Projects, Exams
CO4	Apply probability and statistics in real-world situations	Ap	C	Projects, Exams
CO5	Develop critical thinking and problem-solving skills	E	M	Homework, Projects
CO6	Communicate statistical findings effectively	E	M	Presentations, Reports

* - Remember (R), Understand (U), Apply (Ap), Analyse (An), Evaluate (E), Create (C)
# - Factual Knowledge(F) Conceptual Knowledge (C) Procedural Knowledge (P) Metacognitive Knowledge (M)

Detailed Syllabus

Module	Unit	Content	Hrs (45+30)	Mark
I		**DESCRIPTIVE STATISTICS**	**9**	**15**
	1	Concept of primary and secondary data, Methods of collection	1	
	2	Measures of central tendencies (Mean, Median, Mode, HM, GM)	4	
	3	Measures of dispersion, Relative Measures and Absolute Measures	2	
	4	Range, Quartile deviation, Mean deviation, standard deviation, Variance	2	
II		**STATISTICAL INFERENCE AND REGRESSION ANALYSIS**	**11**	**15**
	5	Principles of Least Squares and Fitting of Stright Line	2	
	6	Point estimation: maximum likelihood estimation (MLE), method of moments. Confidence intervals for population parameters.	3	
	7	Pearson's Coefficient of Correlation and Rank Correlation	3	
	8	Simple linear regression and multiple linear regression. Logistic regression for classification problems.	3	
III		**PROBABILITY THEORY**	**11**	**20**
	9	Random experiment, Sample point, Sample Space	1	
	10	Events, Operation of events (Union, Intersection, Complement of Events)	2	
	11	Exclusive and exhaustive events, equally likely events with examples	1	
	12	Classical approach to probability	1	
	13	Axiomatic definitions of probability, simple problems	2	
	14	Conditional probability	1	
	15	Inverse probability	1	
	16	Baye's Theorem	2	
		ADVANCED PROBABILITY DISTRIBUTION	**14**	
	17	Discrete and continuous random variables and probability distribution	2	

IV	18	Binomial distribution: Definition, Expectation, Variance, Moment Generating Function and Problems	2	**20**
	19	Poisson distribution: Definition, Expectation, Variance, Moment Generating Function and Problems	2	
	20	Normal distribution: Definition, Expectation, Variance, Moment Generating Function, Standard normal curve and Problems	3	
	21	Testing of Hypothesis: General principles of testing, Two types of errors	3	
	22	Type of Testing: T-Test, ANOVA-Test, Chi-square test (Concept Only)	2	
V	**Lab Activities (Use Sci Lab)**		**30**	
	1	Implements mean, median and mode hight of then students	20	
		Determine the standard deviation and variance		
		Plot a histogram to visualize their distribution		
		Use SciLab to perform simple linear regression on a dataset with two variables.		
		Implement SciLab code to plot box plots, scatter plots, and density plots for the dataset to explore its characteristics.		
		Use SciLab to perform Least Square		
		Implement algorithms for multiple linear regression and logistic regression in SciLab to predict outcomes based on input features.		
		You have a deck of 52 playing cards. Calculate the probability of drawing a face card (jack, queen, or king) from the deck.		
		Simulate random experiments and calculate probabilities of events using Scilab.		
		Write functions in SciLab to calculate probabilities for events based on given probability distributions (e.g., binomial, normal).		
	2	Case Study	2	
	3	Develop a predictive model using statistical techniques and tools for identifying a real-world problem in Artificial Intelligence.	8	

Mapping of COs with PSOs and POs:

	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PO1	PO2	PO3	PO4	PO5	PO6
CO 1	1	3	-	1	1	1						

CO 2	1	3	-	-	1	-						
CO 3	1	3	-	-	2	2						
CO 4	1	3	-	-	2	2						
CO 5	2	1	-	1	1	-						
CO 6	2	1	1	2	2	1						

Correlation Levels:

Level	Correlation
-	Nil
1	Slightly / Low
2	Moderate / Medium
3	Substantial / High

Assessment Rubrics:

- Quiz / Assignment/ Quiz/ Discussion / Seminar
- Midterm Exam
- Programming Assignments (20%)
- Final Exam (70%)

Mapping of COs to Assessment Rubrics:

	Internal Exam	Assignment	Practical Evaluation	End Semester Examinations
CO 1	✓	✓	✓	✓
CO 2	✓	✓		✓
CO 3	✓	✓		✓
CO 4	✓	✓		✓

CO 5	✓	✓		✓
CO 6	✓	✓		✓

References:

1. Introduction to Mathematical Statistics, Hogg R V Craig A T, Macmillan
2. Mathematical Statistics, Freund J E, Waple R E, Prentice Hall of India.
3. Probability and Statistics for Engineers, Miller I Freund J E, Prentice Hall of India.
4. Statistics for Management, Levin R I, Prentice Hall of India
5. Introduction to Mathematical Statistics, Hogg R V Craig A T, Macmillan
6. Mathematical Statistics, Freund J E, Waple R E, Prentice Hall of India.

Programme	BSc. Computer Science				
Course Code	CSC2VN102				
Course Title	Foundations Artificial Intelligence				
Type of Course	Vocational Minor				
Semester	II				
Academic Level	100-199				
Course Details	Credit	Lecture per week	Tutorial per week	Practical per week	Total Hours
	4	3	-	2	75
Pre-requisites	A course on Discrete Mathematics is recommended				
Course Summary	This course provides an introduction to the field of Artificial Intelligence covering fundamental concepts, problem solving methods such as search algorithms and heuristics approaches and different knowledge representation techniques. The course addresses the ethical dimensions of AI and their societal impacts.				

Course Outcomes (CO):

CO	CO Statement	Cognitive Level*	Knowledge Category#	Evaluation Tools used
CO1	Able to gain insight into the evolution of key ideas and technologies by exploring the	U	C	Instructor-created exams / Quiz/Assignment/ Seminar

	Artificial Intelligence history and its foundational concepts.			
CO2	Able to acquire knowledge and skills to understand, design, implement intelligent agents to perceive, reason and act within their environments.	U	C	Instructor-created exams/ Quiz/Assignment/ Seminar
CO3	Proficiency in various uninformed and informed search strategies along with constraint satisfaction problem solving methods.	U	C	Instructor-created exams/ Quiz/Assignment/ Seminar
CO4	Ability to design and implement logical agents and construct ontologies that capture the semantics of a domain, facilitating knowledge representation.	U	C	Instructor-created exams/ Quiz/Assignment/ Seminar
CO5	Understand the ethical considerations of AI and their societal impacts and gain insights into the future trajectory of AI by analysing the emerging trends.	U	C	Instructor-created exams/ Quiz/Assignment/ Seminar
CO6	Represent various AI problems using algorithmic approaches and enhance problem-solving skills by visualizing solutions through the utilization of software tools.	U, Ap	C, P	Practical Assignment / Observation of Practical Skills
* - Remember (R), Understand (U), Apply (Ap), Analyse (An), Evaluate (E), Create (C) # - Factual Knowledge(F) Conceptual Knowledge (C) Procedural Knowledge (P) Metacognitive Knowledge (M)				

Detailed Syllabus

Module	Unit	Contents	Hrs (45+30)	Marks
	Introduction to AI		**11**	
	1	Artificial Intelligence: Definition and Applications	2	
	2	Foundations of Artificial Intelligence	1	

I	3	History of Artificial Intelligence, State of the Art	2	18
	4	Intelligent Agents: Agents and Environments	1	
	5	The Concept of Rationality, Nature of Environments: Specifying the Task Environment, Properties of Task Environment	3	
	6	Structure of Agents: Agent Programs, Simple Reflex Agent, Model Based Reflex Agent, Goal Based Agent, Utility Based Agent, Learning Agent (Concept Only, No Algorithm required)	2	
II	**AI Problem Solving**		**14**	**20**
	7	Problem Solving Agents (Concept Only), Examples Problems: Toy problems, Real world problems	3	
	8	Solutions for searching: Tree Search and Graph Search and Measuring Problem Solving Performance (Concept Only)	1	
	9	Uninformed Search Strategies: Breadth First Search, Uniform Cost Search, Depth First Search,	4	
	10	Informed search strategies: Greedy Best First search, A* Search, Heuristic Search (Concept Only)	2	

	11	Constrain Satisfaction Problems: Definition, Examples: Map colouring, Job-Shop scheduling	2	
	12	Constraint Propagation: Node Consistency, Arc Consistency, Path Consistency and K-Consistency	2	
III	**Knowledge Representation**		**13**	**20**
	13	Logical agents: Knowledge based agents, The Wumpus world	2	
	14	Logic: Definition, Propositional logic, Syntax and Semantics, Simple Knowledge Base	3	
	15	First Order Logic: Definition, Syntax and Semantic (Models, Symbols and Interpretations, Terms, Atomic Sentences, Complex Sentences, Quantifiers, Equality)	3	
	16	Ontological Engineering: Definition	1	

	17	Categories and Objects: Physical Composition, Measurements, Objects: Things and Stuff, Process, Time Intervals, Fluent and Objects Quantifying Uncertainty (Concept Only)	4	
IV	**AI: Philosophical Foundations and Future**		**7**	**12**
	18	Weak AI: Can machines act intelligently?	1	
	19	Strong AI: Can machines really think?	2	
	20	Ethics and risks of developing Artificial Intelligence	2	
	21	Agent components and architectures	1	
	22	Are we going in the right direction? What if AI succeed?	1	
V	**Lab Activities**		**30**	
		1. Identify the various software platforms for AI programming. 2. Identify the various platforms used for No-Code AI (Google Cloud Auto ML, Microsoft Azure Al Buildeer, IBM Watson Studio etc.) 3. Use chatbot platforms like ChatGPT or any other to engage in conversational interactions and understand how natural language processing works. 4. Use online tools or any applications that demonstrate image recognition capabilities. 5. Use online platforms or software that provide		

		interactive AI demos and simulations, such as neural network visualisers or AI-powered character generators. 6. Demonstrate the use of AI-based image editing tools (Actions: Remove objects from images, enhance details, or perform automated retouching.) 7. Utilize AI-powered text summarisation tools like SummarizeBot or Resoomer to generate summaries of lengthy articles or research papers. 8. Use any presentation software like Microsoft PowerPoint or Google Slides to demonstrate AI-driven design suggestions and layout recommendations. 9. Explore AI-based translation tools such as Google Translate or DeepL for translating text between different languages. 10. Assign students to analyse news articles, advertisements, or social media posts using AI technologies. 11. Introduce Students to data visualisation using Tableau Public, an accessible data visualisation tool. 12. Use Google's Teachable Machine platform to create a simple image classification model.		
		Case Study: Provide students with case studies or examples of AI applications in different domains (e.g., healthcare, finance, marketing).		
		Organize demos of AI technologies and applications, such as virtual assistants, autonomous vehicles, facial recognition systems, and recommendation engines.		

Mapping of COs with PSOs and POs:

	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PO1	PO2	PO3	PO4	PO5	PO6
CO 1	1	-	-	-	-	-						
CO 2	2	-	2	2	2	2						
CO 3	2	-	2	2	2	2						

CO 4	2	-	2	2	2	2						
CO 5	2	-	2	2	-	-						
CO 6	1	-	1	1	-	-						

Correlation Levels:

Level	Correlation
-	Nil
1	Slightly / Low
2	Moderate / Medium
3	Substantial / High

Assessment Rubrics:

- Quiz / Assignment/ Discussion / Seminar
- Midterm Exam
- Programming Assignments (20%)
- Final Exam (70%)

Mapping of COs to Assessment Rubrics :

	Internal Exam	Assignment	Practical Evaluation	End Semester Examinations
CO 1	✓	✓		✓
CO 2	✓	✓		✓
CO 3	✓	✓		✓
CO 4	✓	✓		✓
CO 5	✓	✓		✓
CO 6	✓	✓	✓	✓

References:

1. Stuart Russell, Peter Norvig, "Artificial Intelligence: A Modern Approach", 3rd Edition, Prentice Hall, 2010.

2. Deepak Khemani, "A First Course in Artificial Intelligence", McGraw Hill Education, 2017.

3. Elaine Rich, Kevin Knight, & Shivashankar B Nair, "Artificial Intelligence", McGraw Hill, 3rd Edition, 2009.

Programme	BSc. Computer Science				
Course Code	CSC3VN202				
Course Title	Automation and Robotics				
Type of Course	Vocational Minor				
Semester	III				
Academic Level	200-299				
Course Details	Credit	Lecture per week	Tutorial per week	Practical per week	Total Hours
	4	3	-	2	75
Pre-requisites	No pre-requisites required				
Course Summary	This course provides a comprehensive overview of automation which includes their production systems, elements, automation functions and usage of discrete and continuous control system. The course also explores the fundamentals of robotics, including anatomy, process control and how these functions could be improved by the integration of Artificial Intelligence.				

Course Outcomes (CO):

CO	CO Statement	Cognitive Level*	Knowledge Category#	Evaluation Tools used
CO1	Understand the production systems and automation, enabling them to analyse, optimize and evaluate the different levels of automation.	U	C	Instructor- created exams / Quiz/Assignment / Seminar
CO2	Able to recognize the difference between the process industries, manufacturing industries, continuous and discrete control system.	U	C	Instructor-created exams/ Quiz/Assignment / Seminar

CO3	Proficiency in understanding the various forms of process control which includes the direct digital control, programmable logic control, distributable control systems etc.	U	C	Instructor-created exams/ Quiz/Assignment / Seminar
CO4	Familiarize with the various hardware components used for automation and process control such as sensors, actuators analog-digital converters etc.	U	C	Instructor-created exams/ Quiz/Assignment / Seminar
CO5	Understand the present developments in the field of automation and robotics and how integrating artificial intelligence can contribute to the future of these systems.	U	C	Instructor-created exams/ Quiz/Assignment / Seminar
CO6	Represent various problems using algorithmic approaches and enhance problem-solving skills by visualizing solutions through the utilization of software tools.	U, Ap	C, P	Practical Assignment / Observation of Practical Skills
* - Remember (R), Understand (U), Apply (Ap), Analyse (An), Evaluate (E), Create (C) # - Factual Knowledge(F) Conceptual Knowledge (C) Procedural Knowledge (P) Metacognitive Knowledge (M)				

Detailed Syllabus:

Module	Unit	Contents	Hrs (45+30)	Mark
I		**Introduction to Automation**	**11**	**15**
	1	Production systems - Facilities, Manufacturing support systems	2	
	2	Automation in production systems – Automated manufacturing system, Computerized manufacturing support systems, Reasons for automating	3	
	3	Manual labour in production systems	1	
	4	Elements of automation - power to accomplish the process, Program of instructions, control system	3	

	5	Advanced automation functions – safety monitoring, maintenance and repair diagnostics, error detection and recovery	1	
	6	Levels of automation	1	
II	**Control Systems**		**13**	**15**
	7	Process industries versus Discrete manufacturing industries, Continuous versus Discrete control	1	
	8	Continuous control system	3	
	9	Discrete control system	1	
	10	Computer process control, Control requirements, Capabilities of computer control	2	

	11	Forms of computer process control - Computer process monitoring, Direct digital control, Computer numerical control and robotics, Programmable logic controllers, Supervisory control and data acquisition, Distributed control systems	3	
	12	Hardware for automation and process control (Concept only) - Sensors, Actuators, Analog to Digital converters Digital to Analog converters, Input/output devices for discrete data.	3	
III	**Industrial Robotics**		**15**	**25**
	13	Robot anatomy – Joints and links, Common robot configurations, Joint drive systems, Sensors in robotics	4	
	14	Robot control systems – Limited sequence control, Playback with point-to-point control, Playback with continuous path control, Intelligent control	2	
	15	End effectors – Grippers, Tools	1	
	16	Robot Programming – Lead through programming, Powered lead through, Motion programming, Advantages and disadvantages	2	
	17	Discrete process control – logic control, sequence control	4	
	18	Programmable Logic Controllers, Components of PLC	2	
	Automation and Robotics: Present and Future		**6**	
	19	Machine Intelligence, Computer and Robotics	1	
	20	Flexible automation vs Robotics technology	1	

IV	21	Artificial Intelligence and Automated Manufacturing, AI and Robotics	2	**15**
	22	Robotics in India, Future of Robotics	2	
V	**Lab Activities**		**30**	
	1	Set up a simulation of a production system using any software tools.	28	
	2	Utilise online simulation tools and platforms that allow students to simulate robot control.		
	3	Utilise online simulation tools and platforms that allow students to simulate automation systems.		
	4	Assign online projects or challenges that require participants to design, program, or simulate automation systems and robotic applications.		
	5	Explore any online virtual reality (VR) applications that simulate manufacturing environments, robotic operations, and automation scenarios.		
	6	Analyze publicly available datasets on platforms like Kaggle, UCI Machine Learning Repository, or Data.gov.		
	7	Experiment with virtual robotics simulations using platforms like V-REP (Virtual Robot Experimentation Platform) or Gazebo.		
	8	Designing and building a simple chatbot using nocode platforms like ChatGPT or Google's Dialogflow.		
	9	Allow students to customize their chatbots by defining conversational flows.		
	10	Provide Programmable Logic Controllers (PLCs) and challenge them to program various control sequences.		
	11	Host a discussion session on the intersection of Artificial Intelligence (AI) and Robotics in automated manufacturing.	2	

Mapping of COs with PSOs and POs:

	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PO1	PO2	PO3	PO4	PO5	PO6
CO 1	1	-	-	-	-	-						

CO 2	2	2	-	-	2	-						
CO 3	2	2	-	-	2	-						
CO 4	2	2	-	-	2	-						
CO 5	1	-	-	-	-	1						
CO 6	-	-	2	2	-	-						

Correlation Levels:

Level	Correlation
-	Nil
1	Slightly / Low
2	Moderate / Medium
3	Substantial / High

Assessment Rubrics:

- Quiz / Assignment/ Discussion / Seminar
- Midterm Exam
- Programming Assignments (20%)
- Final Exam (70%)

Mapping of COs to Assessment Rubrics:

	Internal Exam	Assignment	Practical Evaluation	End Semester Examinations
CO 1	✓	✓		✓
CO 2	✓	✓		✓
CO 3	✓	✓		✓
CO 4	✓	✓		✓
CO 5	✓	✓		✓
CO 6	✓	✓	✓	✓

References:

1. Mikell P. Groover, "Automation, Production Systems and Computer Integrated Manufacturing", 4th edition, Pearson Education, 2017.

2. S.R. Deb, S. Deb " Robotics Technology and flexible automation," Tata McGraw- Hill Education, 2017.
3. Mikell P. Groover, " "Industrial Robots - Technology, Programming and Applications", McGraw-Hill Education, 2017

Programme	BSc. Computer Science				
Course Code	CSC8VN402				
Course Title	Expert Systems and Fuzzy Logic				
Type of Course	Vocational Minor				
Semester	VIII				
Academic Level	400 - 499				
Course Details	Credit	Lecture per week	Tutorial per week	Practical per week	Total Hours
	4	4	-	-	60
Pre-requisites	1. Familiarity with basic logic and set theories. 2. Understanding the fundamentals of computer science, such as algorithms and data structures, can be beneficial for the implementation aspects of expert systems. 3. A basic understanding of probability and statistics is often required.				
Course Summary	The Fuzzy logic and expert systems course introduce two interconnected fields in artificial intelligence: fuzzy logic and expert systems. Fuzzy logic deals with reasoning under uncertainty and imprecision, while expert systems involve the development of computer-based systems that emulate human expertise in specific domains.				

Course Outcomes (CO):

CO	CO Statement	Cognitive Level*	Knowledge Category#	Evaluation Tools used

CO1	Explain the fundamental concepts of fuzzy set theory and interpret membership functions and linguistic variables.	U	F	Instructor-created exams / Quiz
CO2	Design and implement fuzzy controllers for decision-making. Develop fuzzy inference systems (FIS) for various applications and apply fuzzy clustering techniques for pattern recognition.	U	C	Practical Assignment / Observation of Practical Skills
CO3	Describe the role of expert systems in artificial intelligence and Understand knowledge representation techniques in expert systems.	Ap	P	Practical Assignment / Observation of Practical Skills
CO4	Explain the functioning of inference engines in rule-based systems.	Ap	P	Practical Assignment / Observation of Practical Skills
CO5	Acquire domain knowledge for expert system development.	An	C	Instructor-created exams / Quiz
CO6	Construct a knowledge base and define rules for an expert system and implement validation and refinement techniques for expert systems.	Ap	P	Practical Assignment / Observation of Practical Skills
* - Remember (R), Understand (U), Apply (Ap), Analyse (An), Evaluate (E), Create (C) # - Factual Knowledge(F) Conceptual Knowledge (C) Procedural Knowledge (P) Metacognitive Knowledge (M)				

Detailed Syllabus

Module	Unit	Content	Hrs (48+12)	Mark
I	**Introduction to Fuzzy Logic**		**8**	**10**
	1	Overview of Fuzzy Logic	1	
	2	Fuzzy Sets and Membership Functions	2	
	3	Fuzzy Operations (Union, Intersection, Complement)	2	
	4	Basic principles of fuzzy logic. Fuzzification and defuzzification.	2	
	5	Linguistic variables and terms.	1	
II	**Fuzzy Inference Systems (FIS) and Fuzzy Logic Applications**		**12**	**20**

	6	Mamdani FIS-Rule-based systems in fuzzy logic, Rule base and implication methods.	2	
	7	Sugeno FIS-Structure and operation of Sugeno FIS. Comparison with Mamdani FIS.	2	
	8	Basic structure of fuzzy logic controllers (FLCs)	3	
	9	Rule-based systems and fuzzy inference	3	
	10	Applications of fuzzy logic controllers	2	
III	**Introduction to Expert Systems and Rule-Based Systems**		**12**	**20**
	11	Definition and characteristics of expert systems.	2	
	12	Knowledge representation and reasoning.	3	
	13	Expert system components: knowledge base, inference engine, user interface. Examples and applications of expert systems	3	
	14	Rule-based systems and production rules, Forward and backward chaining.	2	
	15	Inference mechanisms in expert systems, Examples of rule-based expert systems.	2	
IV	**Introduction to SCILAB/MATLAB Programming**		**16**	**20**
	16	SCILAB/MATLAB environment and basic navigation, Variables, data types, and basic operations, Script files and running SCILAB/MATLAB code. Introduction to functions and function files.	3	
	17	Introduction to functions and function files, Conditional statements (if, else, elseif), Loop structures (for, while).	2	
	18	Logical operators and relational expressions, Vectorized operations and element-wise operations.	2	
	19	Introduction to arrays, matrices, and vectors, Cell arrays and structures, Indexing and slicing in SCILAB/MATLAB, Working with multidimensional arrays.	2	
	20	Basic file input/output operations, Reading and writing data files (text, CSV, Excel), Data visualization using plotting functions.	2	
	21	Statistical analysis and plotting techniques, Fuzzy logic toolbox in SCILAB/MATLAB.	2	
	22	Expert system development tools in SCILAB/MATLAB, Building expert systems using SCILAB/MATLAB.	3	
V	**Open end**		**12**	
		Case Studies: Real-world applications and their impact. Technological Challenges: Addressing the limitations and exploring new solutions. Future Prospects: Predictions and potential advancements in the field.		

Mapping of COs with PSOs and POs:

	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PO1	PO2	PO3	PO4	PO5	PO6
CO 1	1	3	-	-	-	1						
CO 2	1	3	-	-	1	-						
CO 3	1	3	-	-	2	2						
CO 4	1	3	-	-	2	2						
CO 5	2	1	3	1	1	-						
CO 6	2	1	3	2	2	1						

Correlation Levels:

Level	Correlation
-	Nil
1	Slightly / Low
2	Moderate / Medium
3	Substantial / High

Assessment Rubrics:

- Quiz / Assignment/ Quiz/ Discussion / Seminar
- Midterm Exam
- Programming Assignments (20%)
- Final Exam (70%)

Mapping of COs to Assessment Rubrics:

	Internal Exam	Assignment	Practical Evaluation	End Semester Examinations
CO 1	✓	✓		✓
CO 2	✓	✓	✓	✓
CO 3	✓	✓	✓	✓

CO 4		✓	✓	✓
CO 5		✓	✓	✓
CO 6	✓	✓	✓	✓

References:

1. "Fuzzy Logic with Engineering Applications" by Timothy J. Ross
2. "Expert Systems: Principles and Programming" by Joseph C. Giarratano and Gary D. Riley
3. "Fuzzy Sets and Fuzzy Logic: Theory and Applications" by George J. Klir and Bo Yuan
4. "Expert Systems: Principles and Case Studies" by Efraim Turban, Jay E. Aronson, and Ting-Peng Liang
5. “Introduction to Fuzzy Logic using MATLAB” by S.N. Sivanandam, S. Sumathi, and S. N. Deepa.
6. Nagar, S. (2017). Introduction to Scilab: For Engineers and Scientists. Apress.

Detailed Syllabus of General Foundation Papers/Multidisciplinary Courses (MDCs)

Programme	B. Sc. Computer Science				
Course Code	CSC1FM105				
Course Title	Data Analysis and Visualisation Through Spread sheets				
Type of Course	**MDC**				
Semester	I				
Academic Level	100-199				
Course Details	Credit	Lecture per week	Tutorial per week	Practical per week	Total Hours
	3	3	-	-	45
Pre-requisites	● Basic understanding of computers ● Familiarity with basic mathematical operations				
Course Summary	This course provides a comprehensive introduction to Spreadsheets, focusing on understanding formulas, functions, data organization, analysis techniques, and data visualization. Participants will gain skills in spreadsheet management, data cleansing, analysis, and visualization using Excel's various tools and features.				

Course Outcomes (CO):

CO	CO Statement	Cognitive Level*	Knowledge Category#	Evaluation Tools used
CO1	Students will demonstrate proficiency in managing spreadsheets, including creating, formatting, and manipulating data within Excel workbooks. They will be able to effectively navigate Excel's interface and utilize toolbars.	U	P	Instructor- created exams / Quiz
CO2	Learners will understand the importance of data organization and cleansing in Excel. They will be able to import, export, filter, sort, validate, and remove duplicates from datasets. Students will develop skills to ensure data integrity and consistency, enhancing their ability to work with clean and organized data sets.	U	P	Instructor- created exams/ Home Assignments

CO3	Participants will acquire advanced data analysis skills like pivot	Ap	P	Instructor- created exams
	tables, what-if analysis, and goal seek. They will be able to apply various Excel functions and tools to perform complex calculations, analyze trends, and make informed decisions based on data analysis.			
CO4	Students will gain proficiency in data visualization techniques using Excel. They will be able to create a variety of charts, design pivot charts, dashboards for effective data analysis. Additionally, learners will be able to implement form controls for interactive data manipulation in their visualizations.	Ap	P	Instructor-created exams
CO5	Learners will develop skills in advanced features of Excel like macros, protect data sheets and workbooks, utilize split, freeze, and hide options effectively, incorporate add-ins for extended functionalities, and manage printing options in Excel for professional presentation of data.	Ap	P	Instructor-created exams
* - Remember (R), Understand (U), Apply (Ap), Analyse (An), Evaluate (E), Create (C) # - Factual Knowledge(F) Conceptual Knowledge (C) Procedural Knowledge (P) Metacognitive Knowledge (M)				

Detailed Syllabus:

Module	Unit	Content	Hrs (36+9)	Marks (50)
I		**Introduction to Excel & Understanding Formulas, Functions**	**9**	**15**
	1	Features of Spreadsheet	1	
	2	Parts of Excel Window, Tool bars, Work sheet and Work book, Insertion and Deletion of cells, columns, rows	2	
	3	Formatting in Excel (Merge, Warp, Font Formatting, Number Formatting, Borders and Shading, Colouring)	2	

	4	Range, Autofill, Autosum, Relative, Absolute and Mixed Referencing in Excel, Linking data between worksheets	2	
	5	Formulas and Functions in Excel: Use of Formula Bar, Functions: SUM,ROUND, CEIL, FLOOR,IF, AND,	2	
		OR,AVERAGE, MIN, MAX ,COUNT, COUNTIF, SUMIF, VLOOKUP,HLOOKUP		
II	**Cleansing and Organising Data in Excel**		**9**	**10**
	6	Importance of Data Cleansing and Organisation	1	
	7	Data Import and Export	2	
	8	Filtering and Sorting	2	
	9	Data Validation and remove Duplicates	1	
	10	Group, Ungroup, Subtotal	2	
	11	Conditional Formatting – Highlight Cell Rules, Top/Bottom Rules	1	
III	**Advanced Techniques for Data Analysis**		**8**	**10**
	12	Features of Pivot table	1	
	13	Pivot Table creation	2	
	14	What-if Analysis	2	
	15	Goal Seek	2	
	16	Watch Window	1	
IV	**Data Visualisation Techniques**		**10**	**15**
	17	Creating Charts, Different types of charts	2	
	18	Formatting Chart Objects, Changing the Chart Type, Showing and Hiding the Legend, Showing and Hiding the Data Table	2	
	19	Pivot Chart	2	
	20	Dashboards	1	
	21	Form Controls	3	
V	**Open Ended Module: More about Excel**		**9**	

	1. Recording and Running Macros 2. Protecting Data Sheets and Workbooks 3. Split, Freeze and Hide options 4. Add-ins 5. Printing options in Excel		

References

1. "Excel 2019 Bible" by Michael Alexander and Richard Kusleika
2. "Excel Formulas & Functions For Dummies" by Ken Bluttman and Peter Aitken
3. “Excel with Microsoft Excel: Comprehensive & Easy Guide to Learn Advanced MS Excel” by Naveen Mishra

Assessment Rubrics:

Quiz / Assignment/ Quiz/ Discussion / Seminar
Midterm Exam
Final Exam

Programme	B. Sc. Computer Science				
Course Code	CSC2FM106				
Course Title	Digital Empowerment through Ethical Standards				
Type of Course	**MDC**				
Semester	II				
Academic Level	100 – 199				
Course Details	Credit	Lecture per week	Tutorial per week	Practical per week	Total Hours
	3	3	-	-	45
Pre-requisites	Basic understanding of computers				
Course Summary	This course explores the evolution from pre-digital challenges to the current digital landscape, covering historical milestones, key technologies, and the vision of Digital India. It emphasizes the benefits and importance of digital revolution while addressing ethical and security considerations. Participants engage with digital tools for personal and professional growth and examine case studies on digital infrastructure, missions, and services to understand real-world applications.				

Course Outcomes (CO):

CO	CO Statement	Cognitive Level*	Knowledge Category#	Evaluation Tools used
CO1	Students will be able to analyze the challenges of the pre-digital age and comprehend the importance and benefits of digital revolution, facilitating a deeper understanding of technological evolution.	An	F	Instructor-created exams / Quiz
CO2	Participants will gain familiarity with key digital technologies like Cloud Computing, IoT, AI, and Blockchain, equipping them with the knowledge to identify their applications and potential benefits in different sectors.	U	C	Instructor-created exams/ Home Assignments
CO3	Students will develop insights into Digital India initiatives and emergence of Kerala as Digital Society	U	C	Instructor-created exams

CO4	Through exploration of digital tools	Ap	P	Instructor-
	for personal and professional growth, students will enhance their digital literacy and ability in utilizing tools for data sharing, online learning, networking, and content creation, empowering them to thrive in the digital age.			created exams
CO5	Learners will become aware of ethical and security considerations in the digital age, including privacy concerns, Intellectual Property Rights, key terminologies related to cyber security, and an introduction to cyber laws in India, fostering responsible digital citizenship.	U	C	Instructor-created exams
CO6	Students will analyze real-world case studies of digital infrastructure projects, digital missions, and digital services to demonstrate a comprehensive understanding of the practical applications and implications of digital technologies in various contexts, fostering critical thinking and strategic decision- making skills in digital transformation initiatives.	An	C	Instructor-created exams
* - Remember (R), Understand (U), Apply (Ap), Analyse (An), Evaluate (E), Create (C) # - Factual Knowledge(F) Conceptual Knowledge (C) Procedural Knowledge (P) Metacognitive Knowledge (M)				

Detailed Syllabus:

Module	Unit	Content	Hrs 36+9	Marks (50)
I		**Transition to Digital World**	**7**	**8**
	1	Challenges of Pre-Digital Age	1	
	2	Importance and Benefits of Digital Revolution	2	
	3	Key concepts: digitization, digitalization, digital transformation	1	
	4	Introduction to Key Digital Technologies: Cloud Computing, IoT, AI, Block Chain	3	

II	**Perspective of Digital India & Digital Innovations in Kerala**		**11**	**15**
	5	Understanding Digital India: Concept, Objectives, and Evolution	1	
	6	Overview of Digital Infrastructure: Broadband Connectivity, Digital Literacy, and Access to Information	2	
	7	Vision of Digital India: DigiLocker, E-Hospitals, e-Pathshala, BHIM, , e-Health Campaigns	3	
	8	Kerala-Emergence as Digital Society : Internet & Mobile Penetration in Kerala, 4 Pillars of Digital Emergence in Kerala (Akshaya Project, IT@School Project, Digital Infrastructure Availability, State Data Centre & allied Applications),	2	
	9	Role of K-DISC in Digital Empowerment	1	
	10	Kerala State IT Mission: Core IT Infrastructure, e-Governance Applications, Service Delivery Platforms,	2	
III	**Digital Tools for Personal and Professional Growth**		**9**	**12**
	11	Digital Tools for Data Sharing: Google Drive, Google Sheets	2	
	12	Digital Tools for Data Sharing: Google Docs, Google Classroom	3	
	13	Online learning platforms and resources (e.g., Coursera, Khan Academy, MOOCs, Duolingo)	2	
	14	Networking Tools: LinkedIn	1	
	15	Content Creation and Management: Canva	1	
IV	**Ethical and Security Considerations in the Digital Age**		**9**	**15**
	16	Understanding privacy in the digital age	1	
	17	Legal and ethical considerations in data collection and processing: Intellectual Property Rights (IPR)	2	
	18	Key Terminologies: Cyber Security, Cyber Crime, Cyber Attack, Cyber Espionage, Cyber Warfare	2	
	19	Authentication, Authorisation	1	
	20	Cyber Crimes and Classification	2	
	21	Introduction to Cyber Laws in India	1	
V	**Open Ended Module: Case Study (One from each set)**		**9**	
	1	Case Study on Digital Infrastructure Projects: (Bharat Broadband Network (BBNL) , Submarine Cable Project, Google Data Center)	3	

	2	Case Study on Digital Mission:	3	
		(Digital Literacy Missions in Kerala, SmartDubai Project, China's Digital Silk Road)		
	3	Case Study on Digital Services: (MyGov.in , Moodle LMS, Digital Payment Services)	3	

References

1. "Digital India Importance Needs and Values" by S K Kaushal
2. "Cyber Security in India: Government, Law Enforcement and Corporate Sector" by Vipin M. Chaturvedi and Shivani Kapoor
3. "Information Security: Principles and Practices in Indian Context" by R.S. Pressman, G. Sharma, and G. Sridhar
4. "Introduction to Computer Security" by Michael Goodrich and Roberto Tamassia
5. https://kdisc.kerala.gov.in/
6. https://itmission.kerala.gov.in/

Assessment Rubrics:

Quiz / Assignment/ Quiz/ Discussion / Seminar
Midterm Exam
Final Exam

Model Question Papers

FIRST SEMESTER (CUFYUGP) DEGREE EXAMINATIONS, OCTOBER 2024

Computer Science

CSC1FM103 - Data Analysis and Visualization using Spreadsheets

(2024 Admissions)

Time: Two Hours **Maximum: 70 Marks**

Section A

[Answer All. Each question carries 3 marks] (Ceiling 24 Marks)

1. Define the terms "worksheet" and "workbook" in the context of Excel.
2. Explain three formatting options available for cells in Excel and briefly describe their applications.
3. How can you insert a new row and a new column within an Excel sheet?
4. Write a formula to calculate the average of a range of cells (A1:A10) in Excel.
5. Explain the purpose and benefits of data validation in Excel.
6. Differentiate between absolute and relative cell referencing with an example for each.
7. Describe the concept of Autofill and give an example of how it can be used in Excel.
8. Explain the steps involved in filtering data based on a specific criterion in Excel.
9. Describe the process of importing data from a text file into an Excel spreadsheet.
10. List two commonly used functions for applying conditional formatting in Excel.

Section B

[Answer All. Each question carries 6 marks] (Ceiling 36 Marks)

11. A dataset contains duplicate entries. Describe the steps involved in removing these duplicate rows in Excel.
12. You are given a dataset with sales figures for different regions. Explain how you would create a pivot table to analyse trends in sales across these regions.
13. Explain the concept of "What-If Analysis" in Excel and provide an example of how it can be used to support decision-making.
14. Write a formula using the VLOOKUP function to find the product price based on a product code in another table.
15. Describe three different chart types suitable for visualizing data in Excel and explain when you might use each type.
16. Explain the steps involved in creating a chart from a selected data range in Excel.
17. How can you format chart elements like titles, labels, and data points in Excel to improve clarity and presentation?

18. What is a dashboard in Excel, and what are the benefits of using dashboards for data analysis and communication?

Section C

[Answer any one. Each question carries 10 marks] (1 x 1- = 10 Marks)

19. You are provided with a large dataset containing customer information and sales data.
    a. Describe how you would utilize advanced features like data filtering, sorting, and pivot tables to identify the top 5 customers by sales in a specific region for the past year.
    b. Create a visually appealing dashboard in Excel that summarizes key customer and sales data, including a chart to represent the top-selling products.

(or)

20. Explain the concept of macros in Excel and discuss their potential benefits and drawbacks. Briefly describe the steps involved in creating a simple macro to automate a repetitive task. ***

SECOND SEMESTER (CUFYUGP) DEGREE EXAMINATIONS, OCTOBER 2024 Computer Science
CSC2FM106- Digital Empowerment Through Ethical Standards (2024 Admissions)

Time: Two Hours **Maximum: 70 Marks**

Section A

[Answer All. Each question carries 3 marks] (Ceiling 24 Marks)

1. Briefly discuss the challenges faced in the pre-digital age.
2. Explain the concept of digital transformation and its significance.
3. Briefly describe two key digital technologies and their potential benefits.
4. Explain the importance of Digital India initiatives in empowering citizens.
5. Describe the role of Akshaya Project in Kerala's digital emergence.
6. List four digital tools for data sharing and collaboration.
7. Briefly explain how online learning platforms like Coursera can enhance your professional growth.
8. What are the ethical considerations one should keep in mind while creating content online?
9. Define the term "Intellectual Property Rights" (IPR).
10. Briefly explain the concept of cybercrime.

Section B [Answer All. Each question carries 6 marks] (Ceiling 36 Marks)

11. Compare and contrast the concepts of digitization and digitalization.
12. Explain the working principle of Cloud Computing with its advantages and limitations.
13. Describe the Internet of Things (IoT) and its potential applications in different sectors like healthcare or agriculture.
14. Discuss the four pillars of Digital Emergence in Kerala.
15. Explain the role of K-DISC (Kerala Development and Innovation Strategic Council) in digital empowerment.
16. Describe how online collaboration tools like Google Sheets can be used for data analysis and visualization.
17. Explain the concept of cyber security and differentiate between authentication and authorization.
18. Briefly discuss the different types of cyber attacks and how to protect yourself online.

Section C

[Answer any one. Each question carries 10 marks] (1 x 1 = 10 Marks)

19. a) Analyze the importance of digital literacy in the 21st century. Discuss how ethical considerations shape responsible digital citizenship.
    b) Using a real-world example, critically evaluate the impact of a digital mission or service on a specific community.

20. a) Explain the concept of Blockchain technology and its potential applications in various fields.

    b) Discuss the legal framework for cyber security in India. Briefly explain some key cyber laws.

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